

ELECTRICAL CONSTRUCTION AND MAINTENANCE

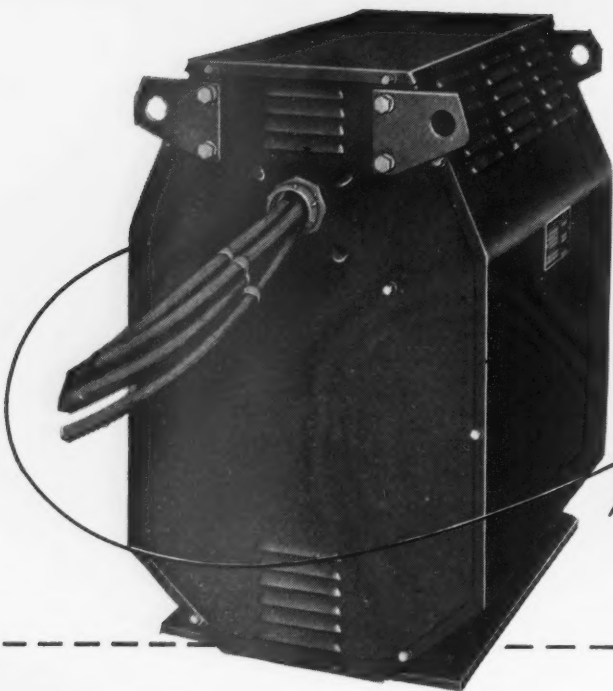
SEPTEMBER · 1948

Selling **PLANNED LIGHTING**

How to sell modern planned lighting installations. A 24 page feature section on lighting markets and practical sales methods for electrical contractors.

SEP 20 1948

A M c G R A W - H I L L P U B L I C A T I O N



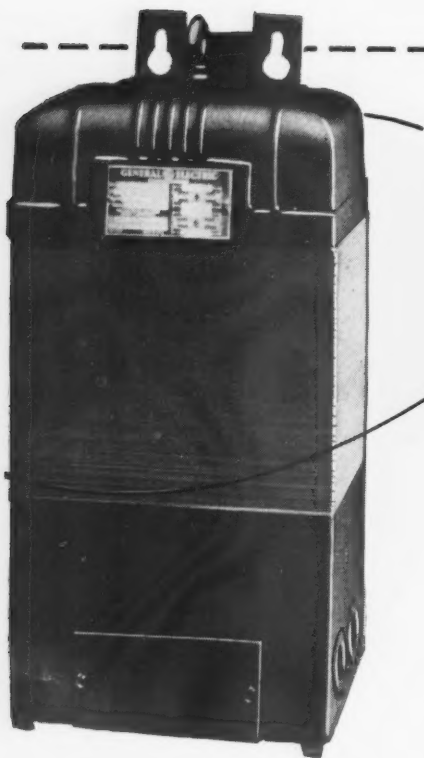
...for ratings of 15 kva and up. Type D's will give long-lived indoor service for phase changing and all general power and lighting applications.



**for
Power
where you
want it**

GENERAL ELECTRIC M & D DRY-TYPE TRANSFORMERS are small and compact in size, require no fireproof vaults, can be installed near the load.

Ideal for power and lighting circuits 600 volts and below, these transformers are easy to install, quiet in operation, and completely dependable. All ratings are available for quick delivery—many standard ratings from stock. See your nearest G-E apparatus distributor, or write *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



...for requirements calling for 0.25 to 10 kva ratings. Versatile Type M units perform equally well indoors or out—for lighting, phase changing or general power needs—or for 32-volt lighting circuits in standard ratings.

GENERAL  **ELECTRIC**

411-26

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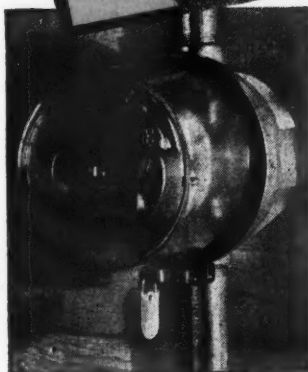
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EASILY ADJUSTED LIKE THIS!



IN SOCKET METER
CASES — for
VERTICAL
or
HORIZONTAL
MOUNTING

HOW the heavy HUB
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THIS newest Murray feature—and the pictures show how simple it is—vastly increases the use of these socket meter cases, drawn of 3 So

aluminum. The speed with which the reversal can be made, commends it to all electricians; and the fact that the same case does equally well for vertically or horizontally mounted meters, reduces the stock which dealers must carry.

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Porcelain Enameled — Instantly
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Look to Appleton Lighting Equipment for maximum lighting efficiency at minimum installation, service and operating expense—whatever the illuminating requirement, whether indoors or out.

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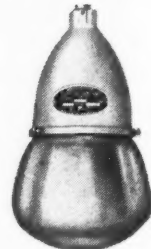
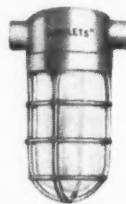
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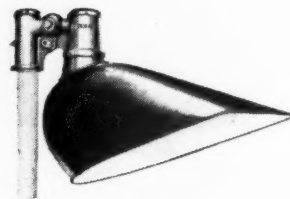
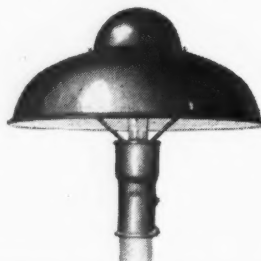


STANDARD FOR BETTER LIGHTING



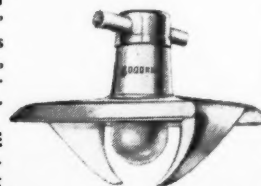
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Appleton—makers of the *FIRST* Explosion-Proof Fluorescent Lighting Fixture—offers numerous types and combinations of dependable Explosion-Proof Fixtures. Dust-Tight and Vapor-Tight Fixtures, too, in a variety of types and sizes to meet your requirements.



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ELECTRICAL CONSTRUCTION AND MAINTENANCE

With which is consolidated *Electrical Contracting*.
The Electragist and Electrical Record... Established 1901

A practical technical and management journal for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering installations, repairing, maintenance and management, in the field of electrical construction and maintenance.

September • 1948

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a thousandfold. A wide choice of studs
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list *all* the jobs that TEMPOTOOL is performing every day;
but if you're interested in cutting fastening costs,
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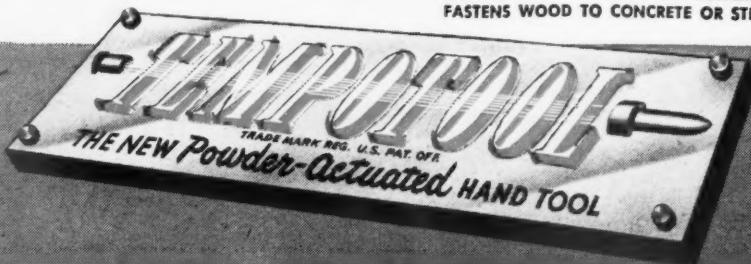
PATS.
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Tempotool Model
"22" with Safety
Shield

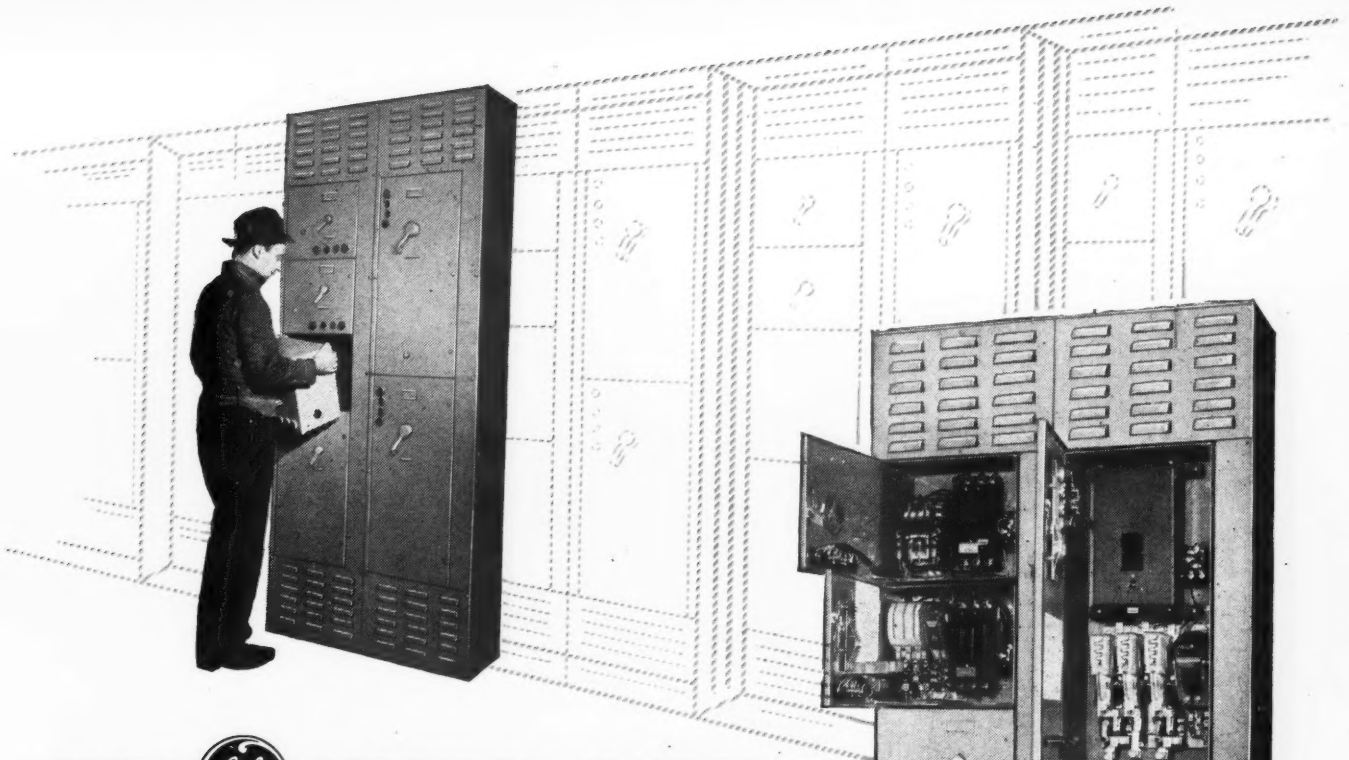
Tempotool Model
"38" with Safety
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FASTENS STEEL TO STEEL OR CONCRETE
FASTENS WOOD TO CONCRETE OR STEEL

like that!



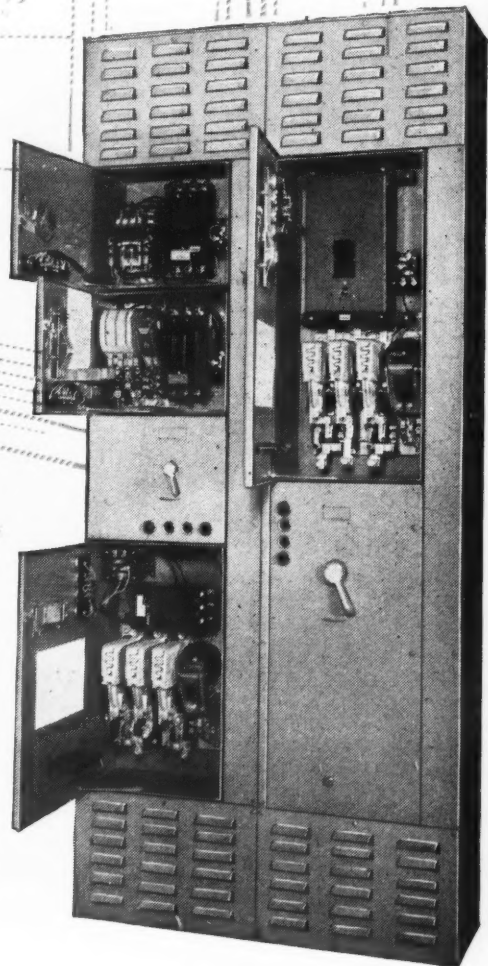
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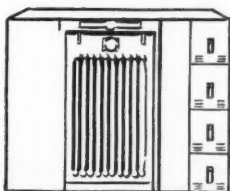
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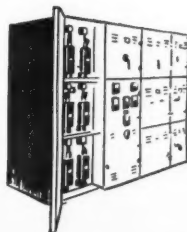
Development of this control center is yet another proof that General Electric keeps abreast of commercial-building needs with complete electric equipment for elevator, pump and blower drives—power distribution and conversion purposes. Your nearest G-E sales office will have an application engineer help you plan your entire system. Also, write for Bulletin GEA-4979, "New G-E Motor Control Center." Apparatus Dept., General Electric Co., Schenectady, N. Y.



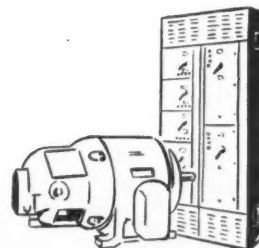
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Motors and Control

GENERAL ELECTRIC

685-105

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IMPACT
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- (Uses Standard Attachments)
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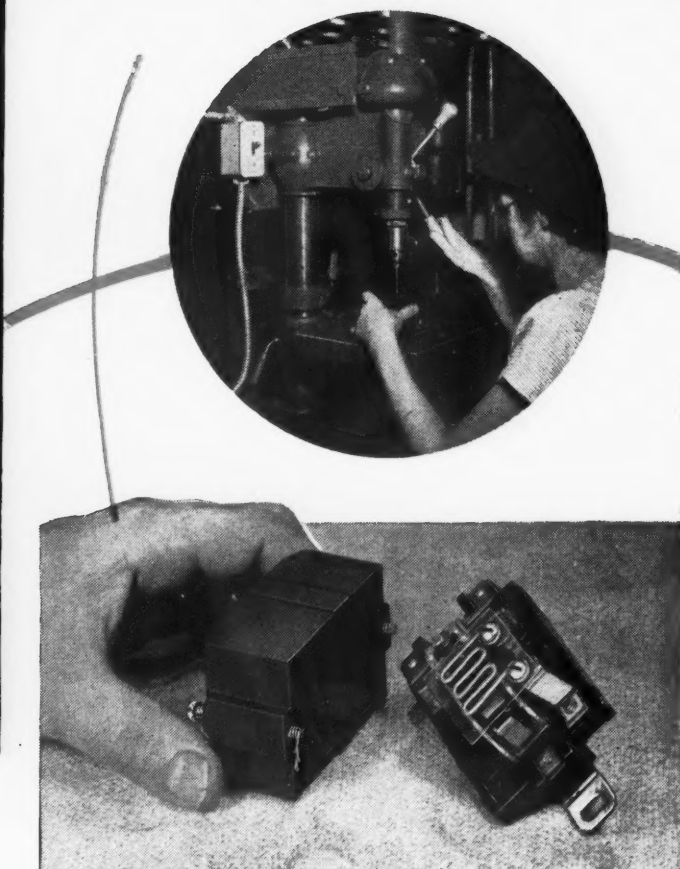
Ideal for installation crews—one manufacturer has equipped his installation crews with IMPACT Tools and attachments. Now, in place of 3 or 4 electric tools they carry only one and also save from 10 to 20 percent of the installation time.

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EASIER INSTALLATION

- All wiring terminals easily accessible on top of switch unit
- Heaters have one mounting screw fastened in position to prevent incorrect mounting—stamped with current rating

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- Employs sturdy bi-metallic protective device
- Positive indication power is off as switch handle moves to OFF position on overload

LONGER LIFE

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*Fractional Horsepower

- High interrupting capacity—arc snuffed quickly as silver contact recedes into recess in base

USE...

On a-c up to 1 hp at 110 to 220 volts

On d-c— $\frac{3}{4}$ hp 115 volt, $\frac{1}{8}$ hp, 230 volt

double-pole forms for 1 hp, 115 to 230 volts d-c
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Apparatus Dept., Sec. C676-276
General Electric Company
Schenectady 5, N. Y.

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I want to know more about your new CR1061 switches.
Please send me Bulletin GEA-2234E.

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COMPANY

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GENERAL  ELECTRIC

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Complete Line for General Installations

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No. 1913-I — Duplex Convenience Outlet of white Ivorylite, with 4 binding screws for side-wiring only. T-slots and wide plaster ears. Long-proved a most dependable receptacle for high-grade residential wiring. (For brown plastic base, specify No. 1913.)

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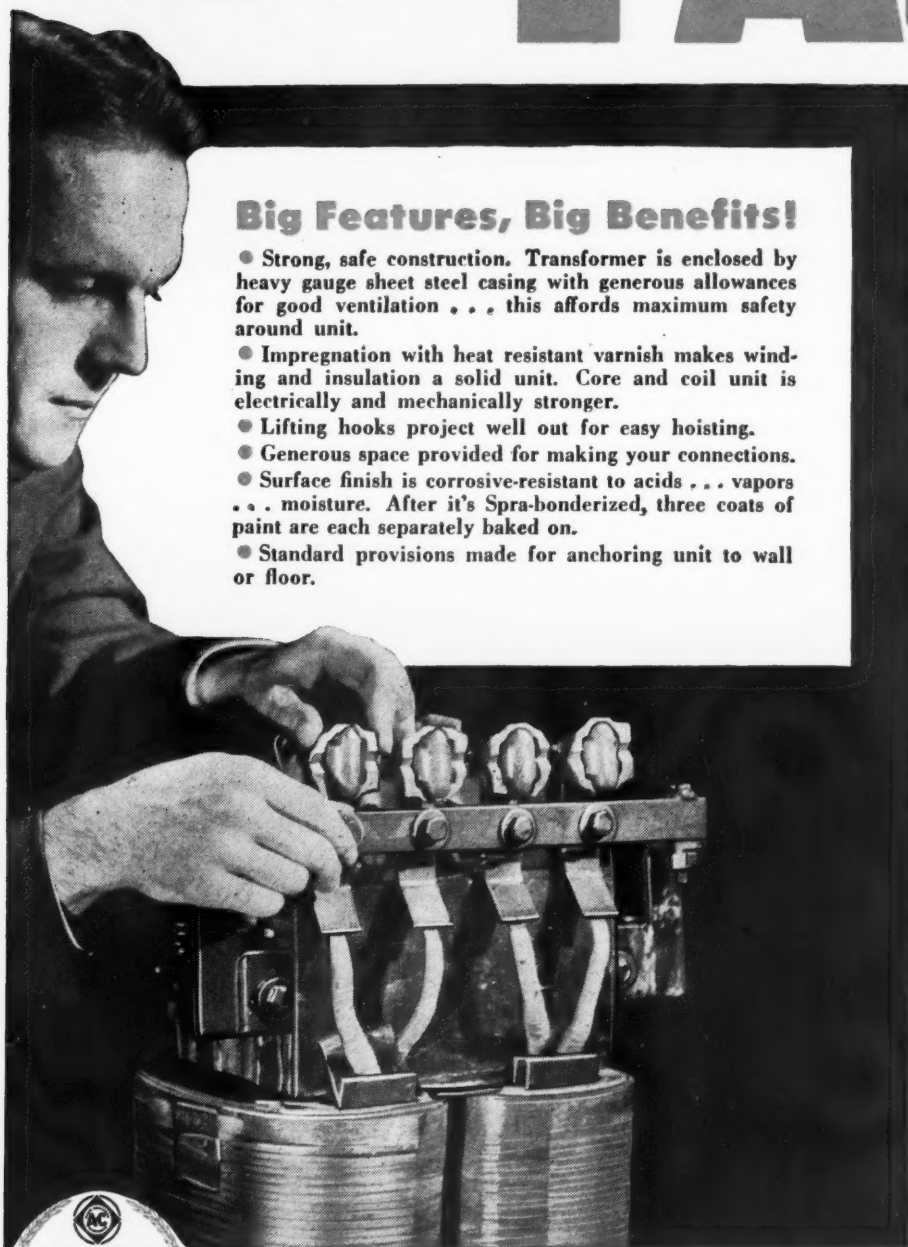
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**POWER
WHERE YOU
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FAST!

Big Features, Big Benefits!

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- Generous space provided for making your connections.
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- Standard provisions made for anchoring unit to wall or floor.



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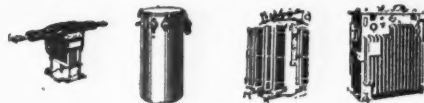
One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

**CLAMP-TYPE CONNECTORS
SAVE HOOK-UP TIME, UNITS
ARE LIGHTER, SMALLER . . .
EASIER TO INSTALL!**

TIME SAVING . . . labor saving solderless clamp-type connectors put your transformer on the line faster, and that means idle equipment goes back to work faster. Clamp connectors are standard on Allis-Chalmers single phase units 15 kva and larger and on three phase units 37½ kva and larger.

In addition, Allis-Chalmers Class B insulated transformers are easier to install, easier to move because they are as much as 20% smaller . . . 38% lighter than conventional units using Class A insulating material. Allis-Chalmers dry-type transformers are safe and easy to maintain. Industry prefers them because they can be mounted overhead to save vital floor space. No fire-proof vaults necessary . . . because a large percentage of the insulation is inorganic. No insulating liquids to test, filter or change.

There is a complete line, too . . . 14 sizes up to 500 kva . . . single or three phase. Ask your nearby A-C dealer or sales office for Bulletin B-6382, or write **ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.** A 2320



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RIGID steel conduit is the only wiring system approved by the National Electrical Code as moisture-, vapor-, dust-, and explosion-proof in hazardous locations.

Specify and use "Buckeye," the world's largest selling, standard-threaded, full-weight, rigid-steel conduit, and you insure permanent protection for wiring in any location.

Youngstown Buckeye Conduit is distributed through supply dealers in every industrial market.



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of *LIGHT*

This powerful lighting unit provides equalized and gentle brilliance. It diffuses abundant light over large areas and in all directions... LEADER SM-440 is a versatile fixture that's "just right" in many settings... accessible throughout and easy to maintain... durable... popular-priced.

40%
INDIRECT LIGHTING

DIRECT LIGHTING
60%

LEADER SM-440

An all-metal fixture direct-indirect type. Has 35° and 25° shielding with metal louvers (other shielding angles also available). Louvers swing down easily or can be removed entirely.

Fixture is built for mounting individually or in continuous rows. Available in 2, 3 or 4—40 watt units, and in 2—100 watt units. Also available in 2, 3 or 4—lamps in slimline styles.

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Speed the Work

...CUT COSTS WITH *Genuine*
TOLEDO THREADERS



Worker using Toledo 3-Way Threader, capacity $\frac{1}{2}$ " to 1" pipe; also on the job, Toledo No. 1A Ratchet 1" to 2" Threader, and Toledo Thread Cutting Oil.

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YOU CAN BE SURE IF IT'S Westinghouse

TUFFERNELL INSULATING VARNISH

Guards Electrical Coils *"When the Heat's on"*

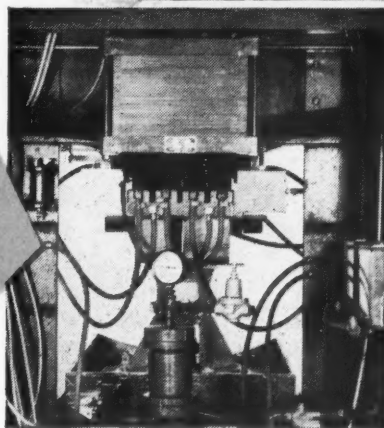
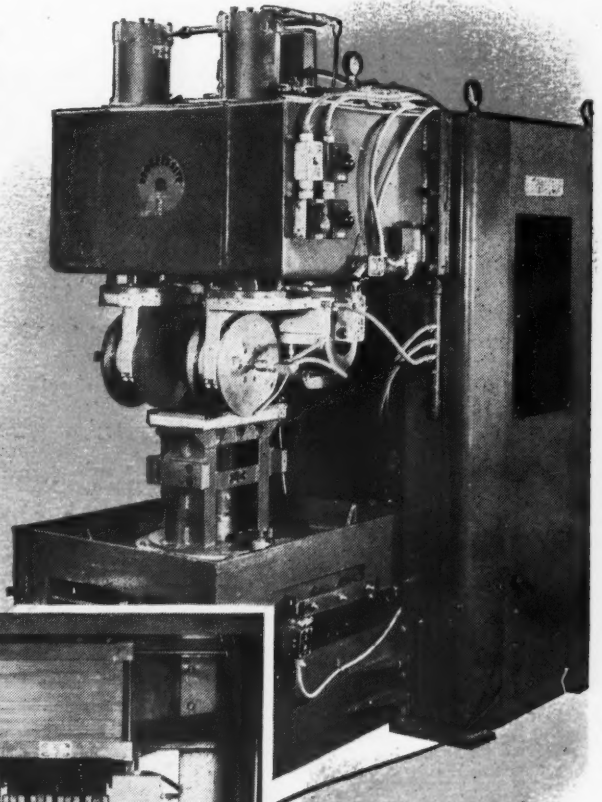
Electrical insulating requirements vary widely for different apparatus and methods of application. Selection of the *right* insulating varnish is highly important. That's the reason Westinghouse offers more than 70 different types of Tuffernell Varnishes and Finishing Enamels . . . why Westinghouse varnish specialists are often called on to develop special formulas to meet unusual conditions.

For instance, Progressive Welder Company, Detroit, had an insulating varnish problem that was readily solved with Tuffernell B-163. This is one of the newer Westinghouse dipping varnishes. It's thermosetting, dries thoroughly in deep sections. It has high dielectric and bonding strength, with excellent resistance to moisture, acid, alkali and oil, and is ideal for coils and wound apparatus. It provides these advantages at a price competitive with inferior products.

HERE'S HOW TUFFERNELL B-163
SOLVES TOUGH TRANSFORMER
INSULATING JOB . . .

In this application, Tuffernell B-163 insulates coils in transformers built into Progressive Resistance Welders. These include pedestal, press, flash and seam welders.

One of the tougher spots is in the seam welder, where the varnish must protect transformer coils against abnormal humidity and sustained temperatures. The transformer must do its job in a virtual "bath" of water vapor, which results from vaporization of water used for cooling the welder rolls . . . induced by heat developed in the welding process.



A continuous load on the transformer, produced by the rapidly repeated impulses required for seam welding, generates heat within the transformer that would quickly break down a varnish of lower dielectric strength. Service records show no varnish failures, even where transformers are subjected to considerable overloads.

The complete line of Tuffernell Varnishes is described in Bulletin AD-65-120. Get your copy from your nearby Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-06414

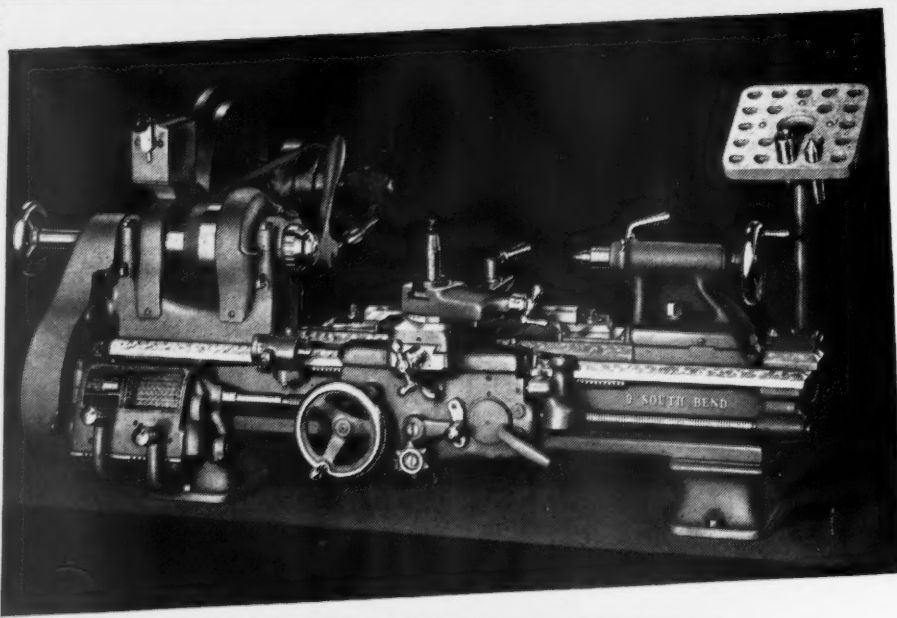


TUFFERNELL INSULATING VARNISHES
... for every electrical need



NEW ELECTRICAL
DEVELOPMENTS
#4

Precision Protection for Precision Machinery



SOUTH BEND PRECISION LATHES ...

9-inch Precision Toolroom Bench Lathe with quick-change gear box providing 48 screw thread feeds, 48 power longitudinal carriage-feeds, and 48 power cross-feeds.

Modern **ECONOMY** "De-Lay" Renewable Fuses

Costly precision machines are worth protecting against the costly delays caused by needless fuse "blows," resulting from momentary overloads.

More and more machinery and electrical equipment are getting this protection with ECONOMY "De-Lay" Renewable Fuses, which give maximum protection in the 135 to 200% ranges where most overloads occur.

Consult your Electrical Wholesaler; he can promptly supply you with these new ECONOMY "De-Lay" Renewable Fuses and Renewal Links.

You are invited to
write for the New
Economy Catalog.

**ECONOMY
DE-LAY**

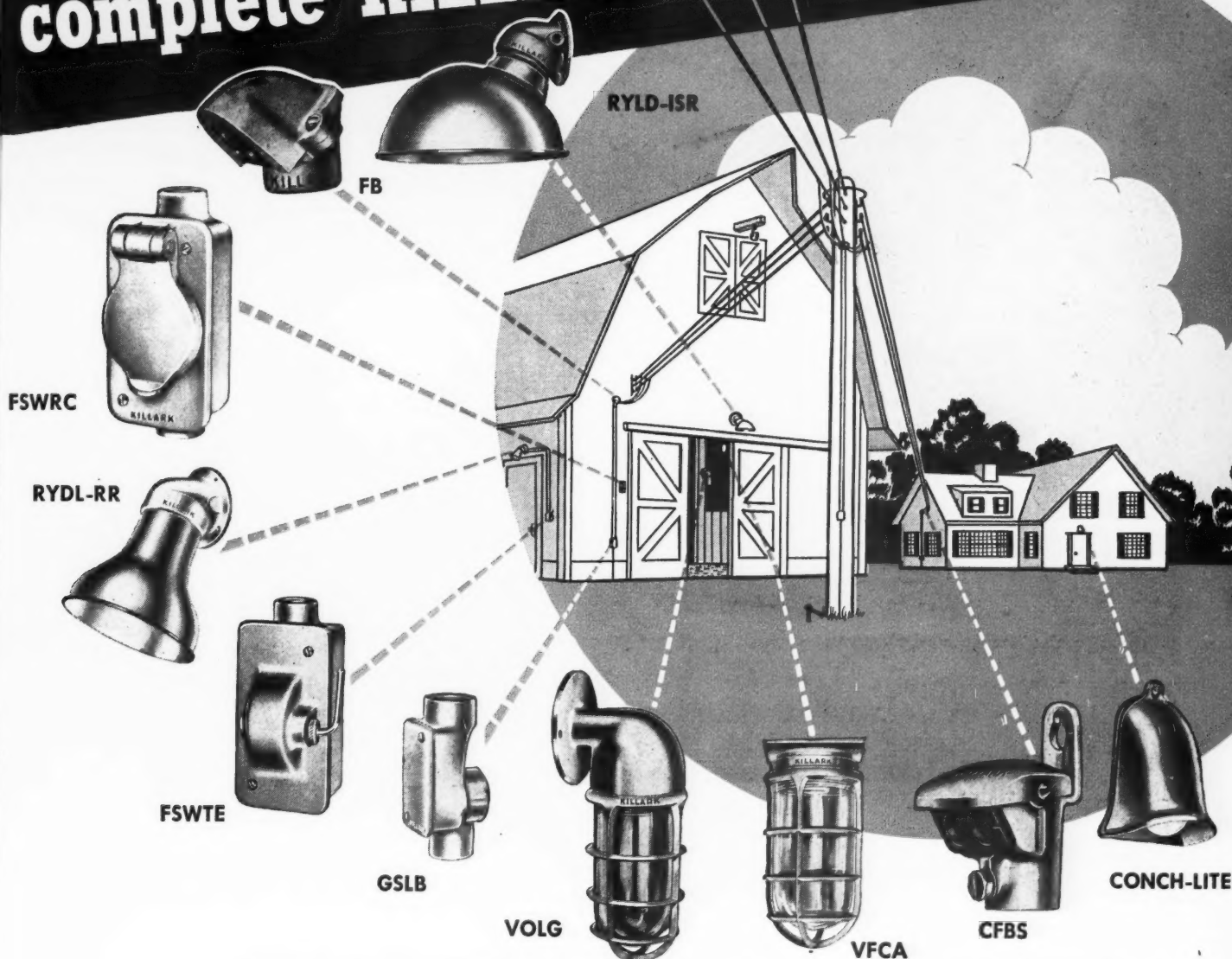
RENEWABLE CARTRIDGE FUSES



ECONOMY FUSE & MFG. CO., 2717 GREENVIEW AVE., CHICAGO 14, ILL. REPRESENTATIVES IN ALL PRINCIPAL CITIES

2766

REAL BUSINESS with the complete KILLARK REA LINE



Mile after mile, new REA lines are bringing much needed power to vital rural areas—and creating new demands for electrical installations. From outlets for machinery to lights for houses, barns and other buildings—this new development means more business for you. Go after

your share by featuring Killark REA fittings—the profitable and complete line of fittings for rural electrification.

A few of the many popular Killark REA fittings are shown here. By concentrating on the Killark Line you are ready to supply every REA job.

Write for Killark's illustrated bulletin on Rural Electrification Fittings.



Killark

ELECTRIC MANUFACTURING COMPANY

Offices and Warehouses: Atlanta, Baltimore, Boston, Chicago, Denver, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, Syracuse.
Offices: Cincinnati, Cleveland, Dallas, Detroit, Kansas City, Minneapolis, New York.

Vandeventer & Easton Aves.
SAINT LOUIS 13, MO.

The Best Way

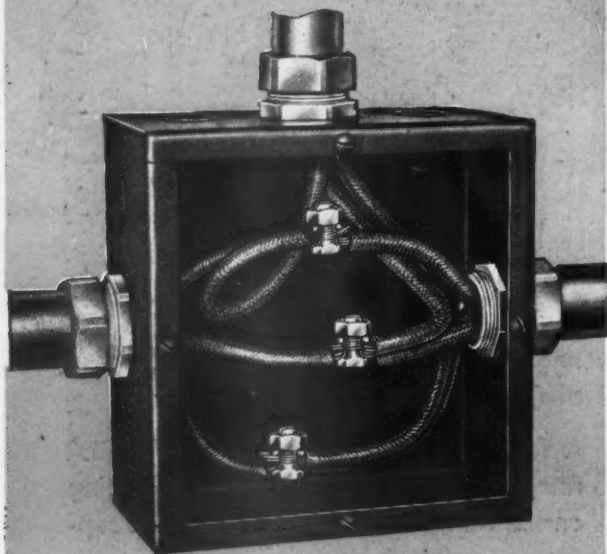
TO MAKE TAPS AND CONNECTIONS-



**HANDIEST! ---
MOST
ECONOMICAL!**

Blackburn is Listed
by Underwriters
for Inside Wiring

BLACKBURN *Hi-Strength* **CONNECTORS**



Tap made in junction box with
Blackburn Hi-Strength Connectors

*Millions in Use
Throughout the World*

The **UNIVERSAL** connector—ideal for any use.

The **HANDY** connector—very easy to use.

The **ECONOMICAL** connector—low initial cost plus labor saving.

The **COMPACT** connector—small, easy to tape.

The **RELIABLE, PERMANENT** connector—made of **DURONZE**, 50% stronger than hard copper or commercial bronze. High strength, at no extra cost!

Listed by Underwriters.

ORDER FROM YOUR JOBBER
WRITE FOR SAMPLES AND NEW CATALOG

JASPER BLACKBURN PRODUCTS CORP., First, Madison & Clinton Sts. • St. Louis 6, Mo.

BUILDERS OF QUALITY PRODUCTS FOR 15 YEARS

ANY WAY YOU LOOK AT IT... **FEDERAL NOARK** Motor Starters cut maintenance costs!

COIL REPLACEMENT...

**not a test of patience . . .
but an A-B-C operation!**

Replacing a coil in a Federal NOARK Motor Starter is simplicity itself. **A**—Press up the coil retaining spring and pull out. **B**—Loosen a screw and lift out the movable magnet. **C**—Disengage the coil leads from the terminals and pull out the coil. A new coil goes in place in seconds! Your own eyes tell you that the simplicity of Federal design saves time . . . where time is important!

Where maintenance means money . . . *save* with Federal NOARK Motor Starters.



Executive Offices: 50 Paris Street, Newark 5, N. J.
Plants: Hartford, Conn., Newark, N. J., St. Louis, Mo.,
Long Island City, N. Y.
SALES OFFICES IN PRINCIPAL CITIES

Federal NOARK
Motor Starters



Plus

- Simplified OVERLOAD ELEMENT
- Frictionless SOLENOID ACTION
- Rapid CONTACT RENEWAL

Federal Electric Products Company, Manufacturers of a Complete Line of Electrical Products including Motor Controls • Safety Switches
Service Equipment • Circuit Breakers • Panelboards • Switchboards • Bus Duct

How will

Dry-Type Power Centers

provide **BETTER** answers to your power distribution needs?

GREATER SAFETY

MORE ECONOMICAL

LESS MAINTENANCE

EASIER INSTALLATION

MINIMUM SPACE

GREATER RELIABILITY

PLEASING APPEARANCE

FIRST CONSIDER ALL THESE ADVANTAGES

- Fire and explosion-proof
- No exposed live parts
- Positive interlocking of circuit breakers and switches
- Separate breaker compartments
- Costly vaults eliminated
- Location near center of load
 - Shorter secondary cables—less copper
 - Better voltage regulation
 - Lower line losses
- Light weight
- No testing or reconditioning of liquids
- No maintenance of gaskets, valves and level gauges
- All parts readily accessible
- Drawout circuit breakers quickly inspected or replaced
- Shipped complete—installed as a unit
- Light weight
- "Unitized" design saves valuable floor space
- Undivided responsibility for manufacture and correct functioning of all equipment
- Factory-assembled and tested—as a unit
- Enclosures of modern matched design



Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Now, Do You Have All the Answers?

... no, not quite, for it is almost imperative that you select the best power distribution system possible.

What is the Best system?

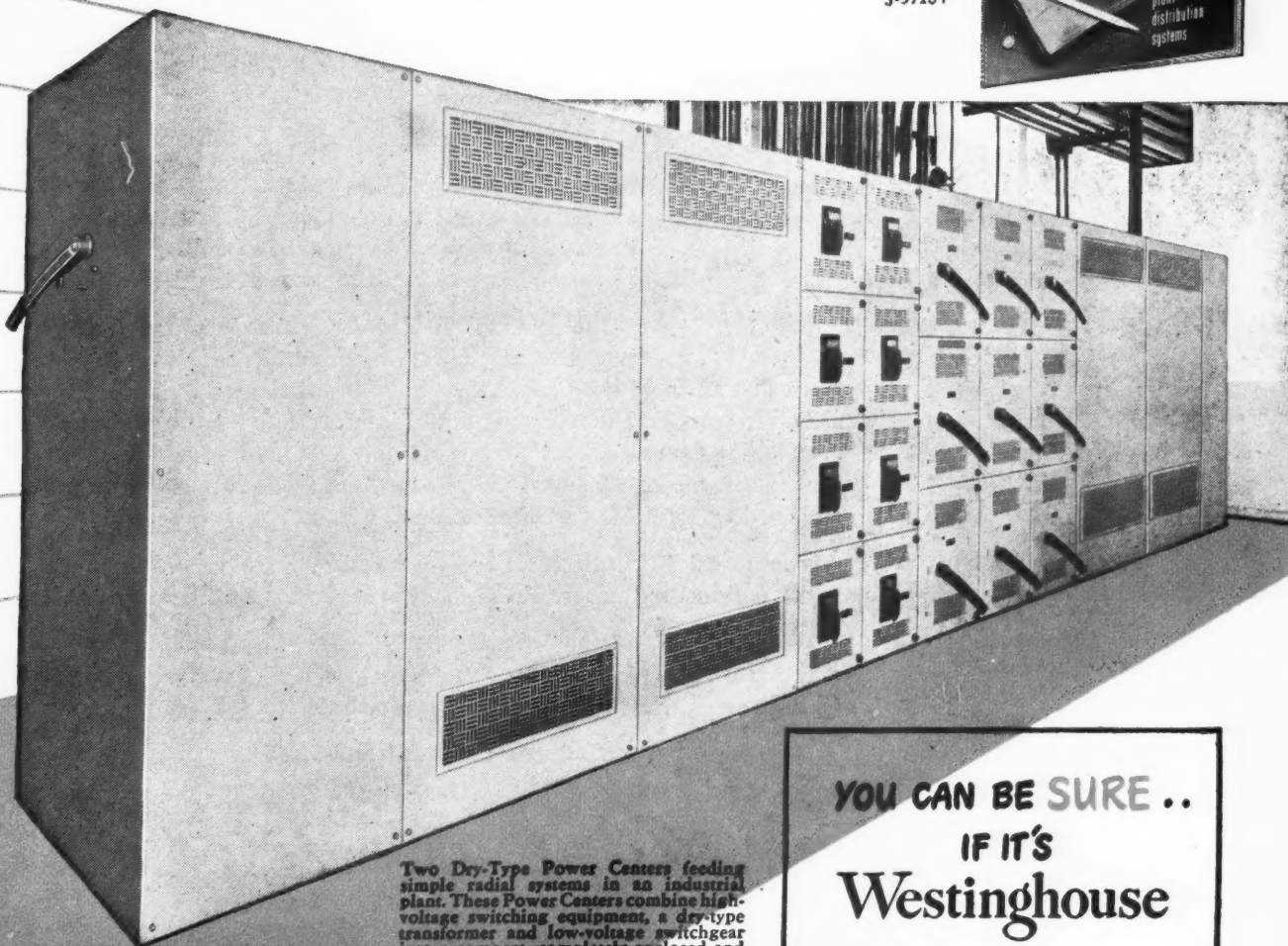
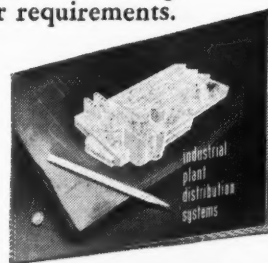
... it is the system which gives the greatest value per dollar of investment and economically and safely supplies adequate electric service to both the present and future plant loads.

Close Westinghouse co-operation and years of practical experience with all types of industries have led to many outstanding achievements in the development of new distribution systems, methods and equipment.

Westinghouse offers such co-operation to all industries in searching out better answers to all phases of distribution and application of power.

Write for the new booklet "*Industrial Plant Distribution Systems*". Fact-filled pages and colorful diagrams will help you in selecting a system that best meets your requirements. Call your Westinghouse office. Ask for B-4045— or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-97134

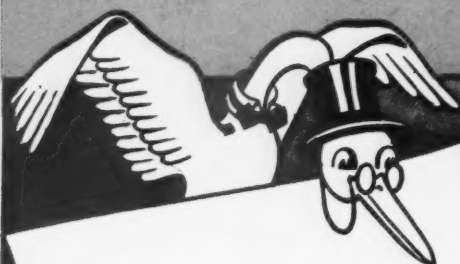


Two Dry-Type Power Centers feeding simple radial systems in an industrial plant. These Power Centers combine high-voltage switching equipment, a dry-type transformer and low-voltage switchgear into a compact, completely enclosed and fully co-ordinated unit.

YOU CAN BE SURE ..
IF IT'S
Westinghouse

MODERN EQUIPMENT FOR MODERN DISTRIBUTION SYSTEMS

JUNIOR'S first photo



*The
Frank Adam Electric
Company
proudly announces the
arrival of the
Type AC JUNIOR
Automatic Thermal Trip
CIRCUIT BREAKER
10-15-20-30 AMPERES
120 VOLTS A. C.
Single Pole*



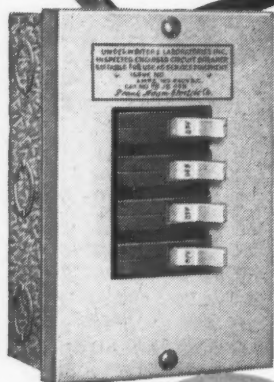
THE NEWEST ADDITION TO THE **FA** LINE IS THE TYPE AC JUNIOR CIRCUIT BREAKER . . . a smaller size and capacity circuit breaker that provides *auto-*matic circuit protection as effectively and efficiently as any full-sized circuit breaker of equal capacity.

These small JUNIOR Circuit Breakers interrupt short circuits and dangerous overloads automatically, and trip the handle to the "off" position to indicate the circuit in trouble. There's no doubtful intermediate handle position . . . nothing to replace . . . no danger of shock. And to restore service, simply flip the handle back to the "on" position . . . just like the standard **FA** type AC Circuit Breakers.

You'll find JUNIOR ideal for oil burner or stoker protection, small residences, stores, garages, or wherever a smaller capacity circuit breaker is desired.

For more complete information about JUNIOR, see your nearest **FA** Representative (he's listed in Sweet's) or . . .

Write for Bulletin No. 203



Frank Adam Electric Co.

ST. LOUIS 13, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKMETER

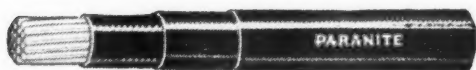
AND DON'T FORGET "JUNIOR"



Here's Wiring with a Future

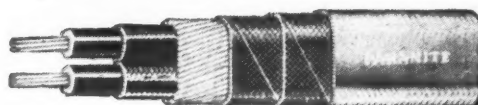
Yes, a long future that's full of satisfaction to the home owner. Wiring that you can specify and install with confidence. For the home wired today with Paranite Building Wire—Paraflex—ABC Cable—Service Cable—will be giving the same efficient electrical service in 1998 and beyond. Every bit of Paranite wire or cable is made under the watchful eye of SQC—Statistical Quality Control! Nothing is

left to chance. Scores of tests, graphs, measurements—figures and figures—by columns and rows of columns—are compiled and analyzed, while the individual operations are still in progress. With Paranite's goal set high and Statistical Quality Control guarding each individual operation, you can confidently recommend and use Paranite Wires and Cables in all construction.

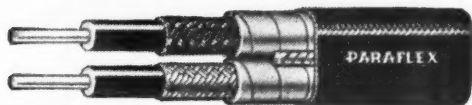


Building Wire

Types R—RH—RW—T—TW



Service Entrance Cable



Paraflex

Non-Metallic Sheathed Cable



A. B. C.

Flexible Metallic Cable

IF IT'S **PARANITE** IT'S RIGHT!

DISTRIBUTED
THROUGH
WHOLESALE

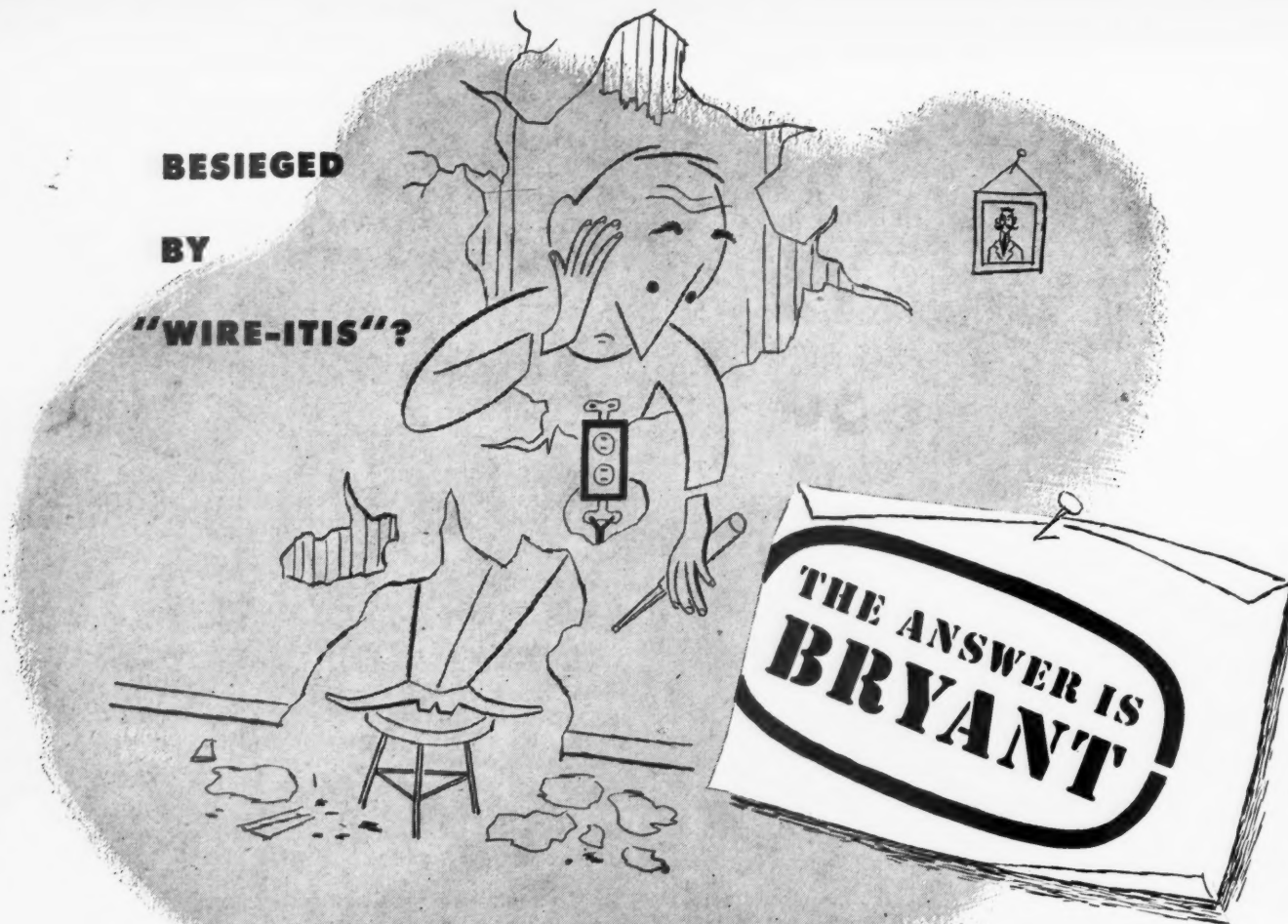
PARANITE WIRE AND CABLE
Division of ESSEX WIRE CORPORATION
FORT WAYNE 6, INDIANA



WAREHOUSES* AND SALES OFFICES: *Atlanta, Ga.; *Chicago, Ill.; Cleveland, Ohio; Dallas, Texas; *Detroit, Mich.; *Kansas City, Mo.;
*Los Angeles, Calif.; *Newark, N. J.; Philadelphia, Pa.; *St. Louis, Mo.; *San Francisco, Calif.

ELECTRICAL WIRES AND CABLES "BETTER THAN CODE REQUIRES"

**BESIEGED
BY
"WIRE-ITIS"?**

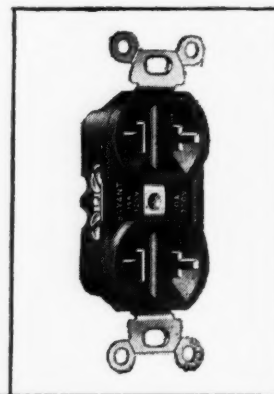


BRYANT "BACK WIRED" OUTLET PROMOTES EASY WIRING

Now—back wiring makes for better wiring. The Bryant 9260 duplex convenience outlet provides perfect mechanical and electrical connections with pressure clamping contacts . . . eliminates wire looping at terminal screws . . . makes installation simple and easy.

The many superior features of this device—the strong conductor clamps, insulation stripping guide, double-sided contacts, T-slots—make it a "must" for specification grade work. It can also be side wired in the conventional manner. Available in brown or ivory.

Your electrical wholesaler will be glad to show you why the new Bryant 9260 outlet is the answer to "wire-itis" problems.



THE BRYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut

CHICAGO • LOS ANGELES



*60th
Anniversary
1888-1948*

A-4504

SPECIFY BRYANT DEVICES FROM YOUR ELECTRICAL WHOLESALER

J-99816

ALWAYS on hand to do
a good job **FASTER!**

**If it's taped with ACCURATE
IT STAYS TAPED!**

There's a reason why ACCURATE Tapes are the kind men like to work with. We've been making tape—and only tape—for over 25 years. Everything we ever learned about making it better, is processed into every foot we make, whether it's friction or rubber.

The next time you buy tape—be sure it's ACCURATE. Break open a box—notice the fresh, tacky "ready to work" feel. Now, put it to the test—start taping.

See how it holds—can't slip off the work. It tapes up tight and neat, gives a smooth, clean job. You get a clean, easy break with no loose ends or threads. Good job? You bet! That's why it's best to buy ACCURATE. Your supplier has it now—friction or rubber, in convenient sizes. Accurate Mfg. Company, Main Offices & Plant: Garfield, New Jersey.

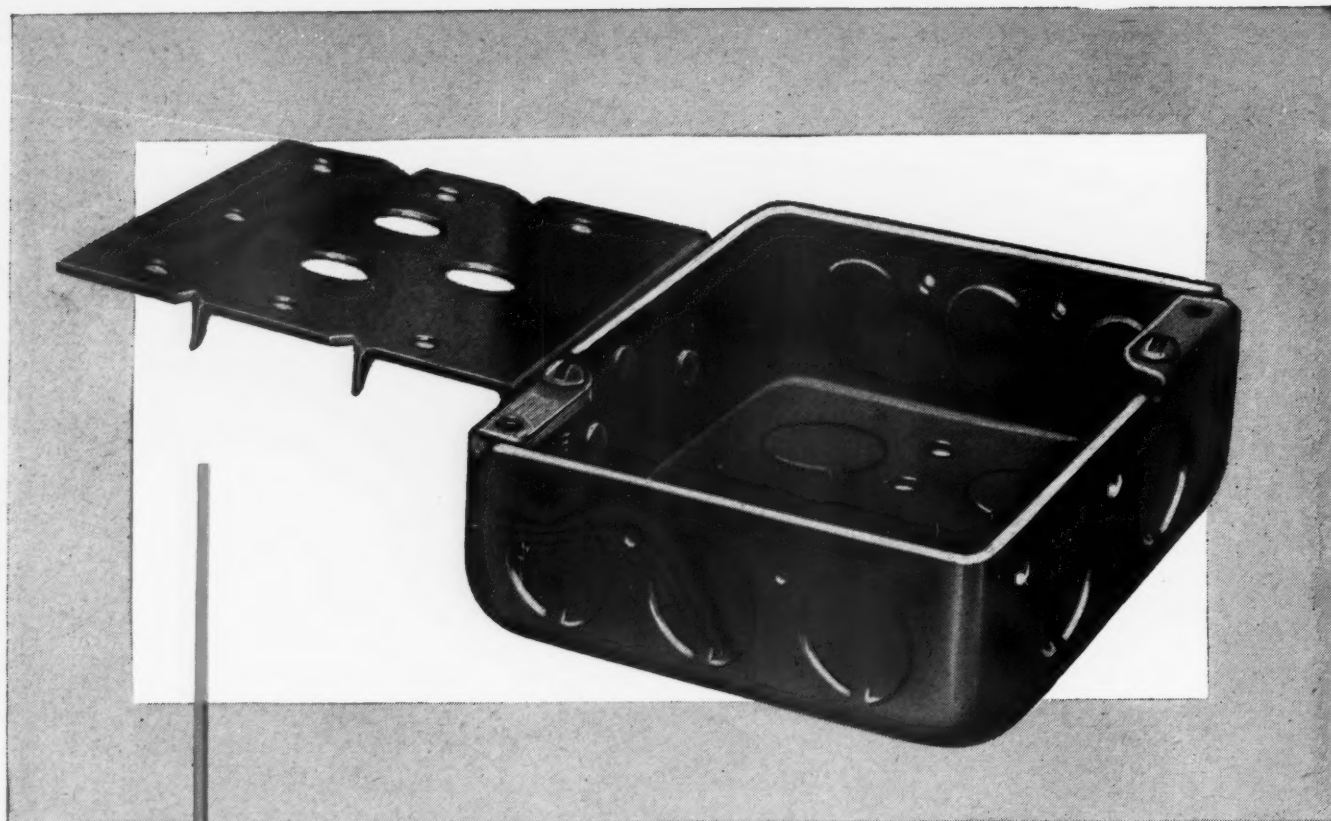
OVER A QUARTER
CENTURY



OF TAPE
SPECIALIZATION

**ACCURATE
TAPES**





RACO

has a good reputation...

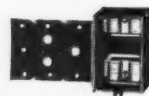
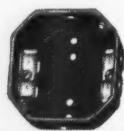
The strength and quality of RACO boxes satisfy the most exacting needs of Contractors, Architects and Designers.

Every item in RACO'S complete line of switch and outlet boxes lives up to this reputation. Quality, workmanship and careful inspection guarantee that these boxes will do their job.

Such a reputation means that contractors have learned to rely on RACO boxes to help speed their jobs along. To jobbers it means that customers are sold on RACO boxes before the orders are filled. To contractors and jobbers alike, RACO means dependability.

RACO

ALL-STEEL PRODUCTS



ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois

"A BOX FOR EVERY NEED"

FOR OVERHEAD SERVICE LINES

THAT GO UP FAST

PREVENT LINE TROUBLE

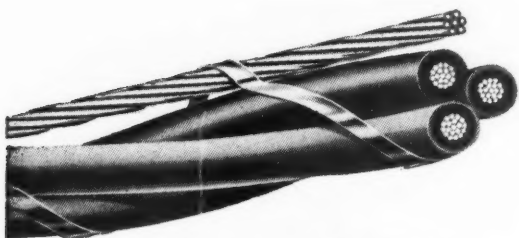
KEEP COSTS DOWN

HAZARD SELF-SUPPORTING AERIAL CABLE

install this pre-assembled cable, messenger and binder ALL IN ONE OPERATION



- Multi-conductor Self-Supporting Aerial Cable for signal and control circuits. Varied insulation colors provide quick circuit identification.



- Three-conductor Self-Supporting Aerial Cable. Hazaprene protective jacket on each conductor makes splicing and terminating simple and fast.

ALUMINUM CONDUCTORS

- Hazard Self-Supporting Aerial Cable available with Aluminum Conductors. Ask your Hazard representative or write us for the facts about lightweight conductors for overhead service.

Where overhead service with insulated cable is indicated, Hazard offers you this simple, self-supporting cable construction that makes installation quick, easy and economical . . . that provides ample protection against tree branches and rough weather . . . that assures lasting, trouble-free, low-cost circuits.

With Hazard Self-Supporting Aerial Cable, specially compounded Submarine rubber insulation provides long-lived, moisture-resisting, electrical protection for the Hazaloy coated copper conductors. Over this insulation goes a tough Hazaprene jacket that's well known for its unusual resistance to sun, cold, moisture, abrasion.

Bound to the cable by a spirally wound metallic tape, a strong Copperweld messenger gives full support between points of suspension. This simple, but effective *all-in-one construction* (cable, messenger, binder) of Hazard Self-Supporting Aerial Cable provides the ideal answer to the problems of installing and maintaining overhead circuits. For more information, ask your Hazard representative or write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

6403

HAZARD



insulated wires and cables for every electrical use



more dollars in your pocket

when you sell...

Blo-Fan

ELECTRIC CEILING VENTILATORS

Because Blo Fan installs in the ceiling, it will fit into any kitchen plan directly over the range...where a fan belongs. You don't have to look for a spot in an outside wall. Blo Fan roughs in between standard joists like any outlet box. Motor assembly snaps into the housing without tools after the job is finished.

Blo Fan delivers the *volume* of a propeller with the *power* of a blower.

Motor fully enclosed, rubber mounted, cooled by air stream. 5-year guarantee.

Stocked by electrical wholesalers in 293 cities in all parts of the United States.

Write for names of distributors and complete catalog.

Blo-Fan

ELECTRIC CEILING VENTILATION



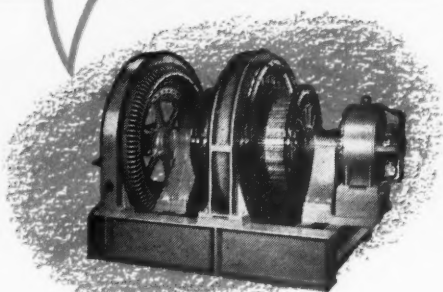
PRYNE & CO., INC. POMONA, CALIFORNIA • LOS ANGELES • SAN FRANCISCO • CHICAGO • NEW YORK

SPECIALIZATION MEANS PROVED PERFORMANCE

● For 35 years, The Electric Products Company has specialized in the manufacture of High-Current, Low-Voltage Motor-Generators and other special electrical equipment. The result is Proved Performance . . . an assurance of lower-cost opera-

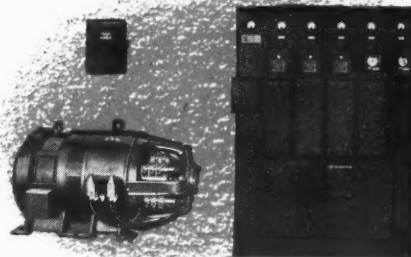
tion, higher operating efficiency and more dependable life-time service. For every application, E.P. designs and builds equipment that fits exactly the requirements of the particular operation.

FOR EXAMPLE:



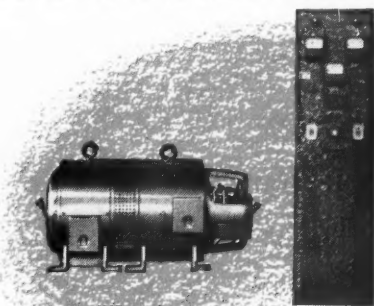
FOR ELECTROLYTIC PROCESSES

E.P. Electrolytic Motor-Generators employ *Undercut Commutator Mica* to prolong commutator and brush life; *Pole Spacers* to help assure sparkless commutation; *Micrometer Adjustment of Interpoles*, an exclusive feature, to guarantee outstanding performance; *Correct Mechanical Design* that means every part of the motor-generator is swept by a cooling stream of air; and *Fully Accessible Construction* for easy inspection.



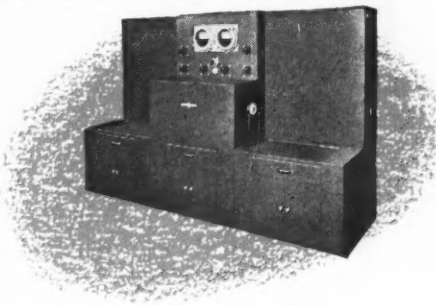
FOR INDUSTRIAL-TRUCK BATTERY-CHARGING

In 1910, The Electric Products Company introduced the first Automatic Battery Charger. Today they most efficiently and advantageously combine: completely automatic operation . . . the modified constant-voltage method of charging . . . individual application design . . . elimination of complicated control or ventilating systems . . . and specialized low-voltage designing.



FOR STANDBY BATTERY-CHARGING

Since 1923, Diverter-Pole Motor-Generators have proved to be the most reliable, maintenance-free and efficient source of direct current for Control Bus Battery Charging. They assure maximum battery life, give full-automatic operation and protect themselves against harmful overloads. Requiring only infrequent inspection, they are extensively used in isolated automatic and supervisory-controlled substations.



FOR INDUSTRIAL TESTING

The design and manufacture of Dynamometers, because of the very high operating speeds and the severe continuous-duty loads, require a manufacturing skill far beyond that needed for conventional equipment: The Electric Products Company has developed this background. Features include oversize bearings, heavy supports and framework, special commutator and armature construction.

● Get the Facts on these and other E.P. Products . . . For complete information, please contact your nearest E. P. representative or write to the address shown below:

EP

X-29

THE ELECTRIC PRODUCTS COMPANY

1734 CLARKSTONE ROAD

CLEVELAND 12, OHIO

ADEQUACY

PERMANENCE

FLEXIBILITY

ECONOMY

SAFETY

**GET ALL Five
FEATURES**
USE PORCELAIN FOR EVERY WIRING NEED

Porcelain Protected Wiring Systems are ADEQUATE because they have higher current carrying capacities. They're SAFE because porcelain is short-proof, shock-proof, rust-proof and corrosion-proof. Porcelain is PERMANENT as proved by installations in

use for over 50 years. Porcelain systems are FLEXIBLE — readily extended, with easy accessibility to open feeders. Porcelain systems are ECONOMICAL, as shown by their adaptability to practically all wiring plans, their low cost, and time-saving features.

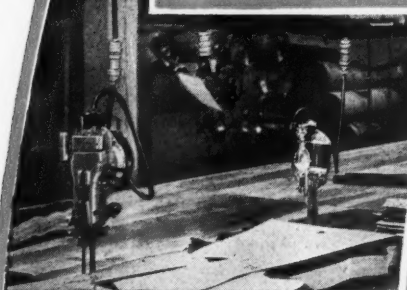
**BE Sure WITH
PORCELAIN PROTECTED WIRING SYSTEMS**

★ ILLINOIS ELECTRIC PORCELAIN CO. ★ PORCELAIN PRODUCTS, INCORPORATED
Macomb, Ill. Findlay, Ohio

★ SUPERIOR PORCELAIN COMPANY ★ UNIVERSAL CLAY PRODUCTS COMPANY
Parkersburg, W. Va. Sandusky, Ohio

WHAT - no wires?

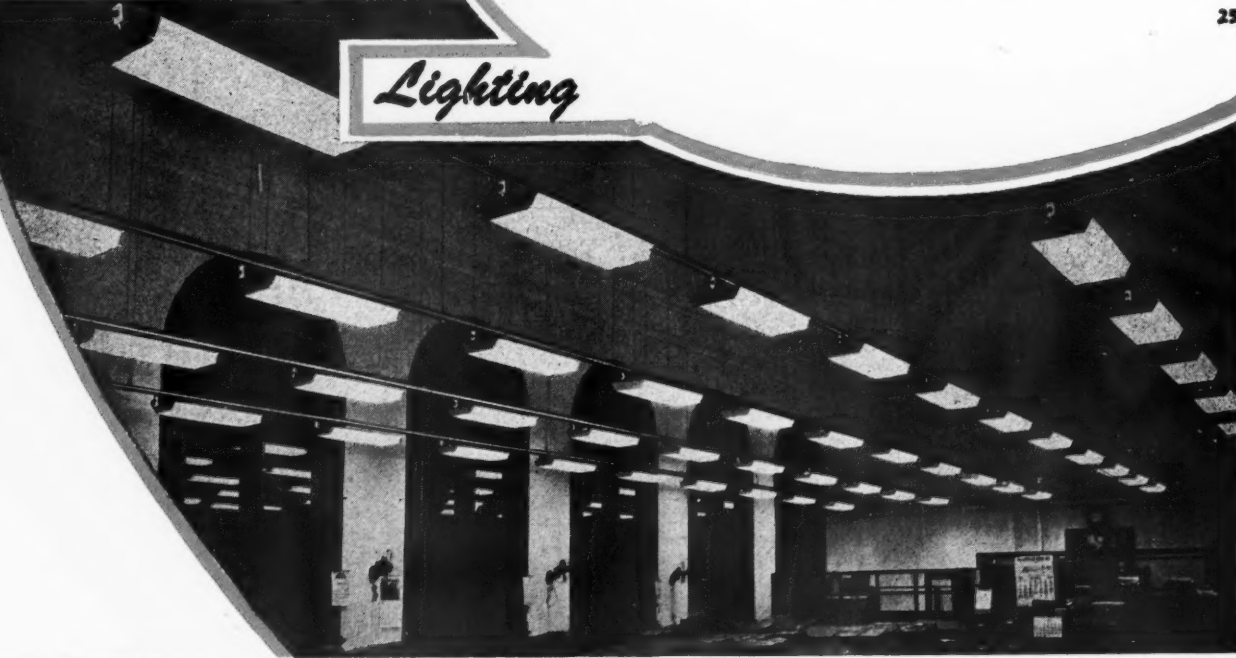
Bench Work



Moving Machines



Lighting



That's about it when Electric Feedrail, the modern, totally enclosed, electrical distribution system is used.

One vertical cable connected to an overhead trolley, through an Ever-Lok trouble-proof connector—no wires to trip over, snag or tangle, no exposed circuits—and you can move the equipment along the line without disconnecting.

Feedrail is also ideal for cranes and hoists, moving test lines and lighting. In fact, anywhere electrical equipment moves. You can save wiring costs, maintenance time, speed up your plant, and make it electrically safe at the same time.

See what others are doing with Electric Feedrail. The new 32 page catalog, No. 20, with more than 100 illustrations and layouts and diagrams, and complete specification data, is yours for the asking. Write for yours now.

25

**ELECTRIC
FEEDRAIL**

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET • NEW YORK 7, N. Y.

Announcing

RESISTS ABRASION 30 TIMES AS LONG
IN THE SCRATCH TEST

LASTS 24 TIMES LONGER
IN THE HEAT AGING TEST

DOES NOT CRACK
UNDER HIGH TEMPERATURES

IS MORE FLEXIBLE

WINDS EASIER

TAKES LESS SPACE
THAN FIBROUS COVERED WIRE

*How AMVAR is
superior to
conventional enameled
magnet wire*

IS HIGHLY RESISTANT
TO INSULATING VARNISH
SOLVENTS

RESISTS MOISTURE BETTER
IN SERVICE

HAS MORE RESISTANCE
TO THERMOPLASTIC FLOW
AT HIGH TEMPERATURE

LOWERS COSTS BECAUSE COILS CAN BE
MADE SMALLER REDUCING SIZE OF MACHINES



Amvar Magnet Wire is made on the most modern continuous process machines which assure the highest quality product with uniform insulation thickness throughout.

AMVAR . . . the finest magnet wire we have ever produced!

AMVAR Magnet Wire is so far superior to ordinary enameled magnet wire that it is necessary to compare them point by point to realize what a vast improvement has been made.

Although enameled wire has high dielectric strength and takes up little room, its mechanical properties leave much to be desired. Generally, a coating of cotton, paper or silk is needed to protect the enamel from chipping. These materials absorb water so they must be coated with insulating varnish to make them resistant to moisture. The final result is a stiff magnet wire, difficult to wind which takes up too much space.

The New Amvar Magnet Wire is coated with a film of polyvinyl acetal synthetic resin. It retains the

high dielectric strength and requires *much less space* than any of the fibrous coated enameled wires. The insulation is extremely tough, abrasion resistant and moisture resistant. It will not crack or chip even under long exposure to heat. Stretch an Amvar wire and the copper will break before the insulation.

Because of its better space factor, machines and equipment designed with Amvar can be made smaller. They cost less and give better, longer service.

Amvar, itself, is lower in first cost than the fibrous covered wire it replaces. You can wind more coils faster and the wires stay put in the coil.

In service, Amvar's freedom from cracking prevents trouble. It withstands prolonged heat up to 105°C., resists most solvents such as alcohol, toluol and naphtha.

Amvar is made on precision machines of the latest design. It can be furnished in round wire in sizes from No. 8 to 40 A.W.G. and in single to quadruple insulation thickness.

Mail the coupon for complete information and a sample of Amvar Wire.

AMERICAN STEEL & WIRE COMPANY
GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



Coating the copper wire with Amvar resin is a precision process which results in an extremely tough cover that does not crack or rupture in service.

Send coupon for FREE sample
of AMVAR

American Steel and Wire Company
Room 402 Rockefeller Building
Cleveland 13, Ohio

Gentlemen:

Please send me more information and a free sample of Amvar Magnet Wire for test purposes.

Name.....

Position.....

Company.....

Address.....



AMVAR MAGNET WIRE

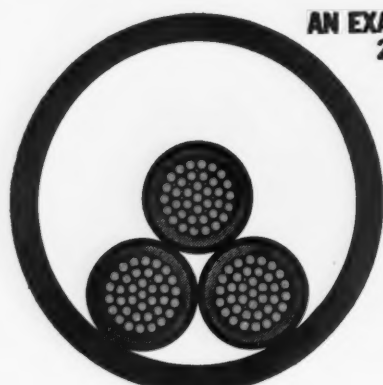
UNITED STATES STEEL

CRESCENT

ENDURITE Type RH

Gives Greater Current Carrying Capacity per Dollar of Installed Cost

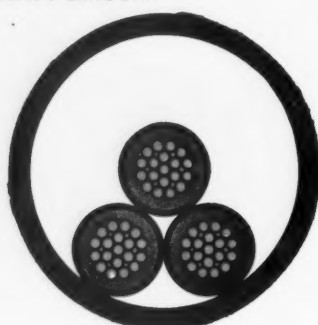
AN EXAMPLE -
200 AMP. CIRCUIT *



250,000 CM

TYPE R

Requires 2½" Conduit. Maximum permissible operating temperature 60°C.



3/0

TYPE RH

Requires 2" Conduit. Maximum permissible operating temperature 75°C.

The superior heat resistant characteristics of CRESCENT ENDURITE INSULATION with its higher permissible operating temperature and therefore greater current carrying capacity, permit the use of a smaller size of conductor, and in most cases smaller size of conduit at less cost than would be required for Type R Wire for the same load.

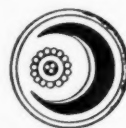
For light loads requiring small sized conductors, Voltage Drop is the determining factor in choice of wire size. Usually in sizes No. 6 AWG and heavier for power circuits or No. 1 AWG and heavier for lighting circuits, CRESCENT ENDURITE Type RH Wire & Cable gives the lowest installed cost-per-ampere of useful circuit capacity.

**In Accordance with 1947 National Electrical Code.*

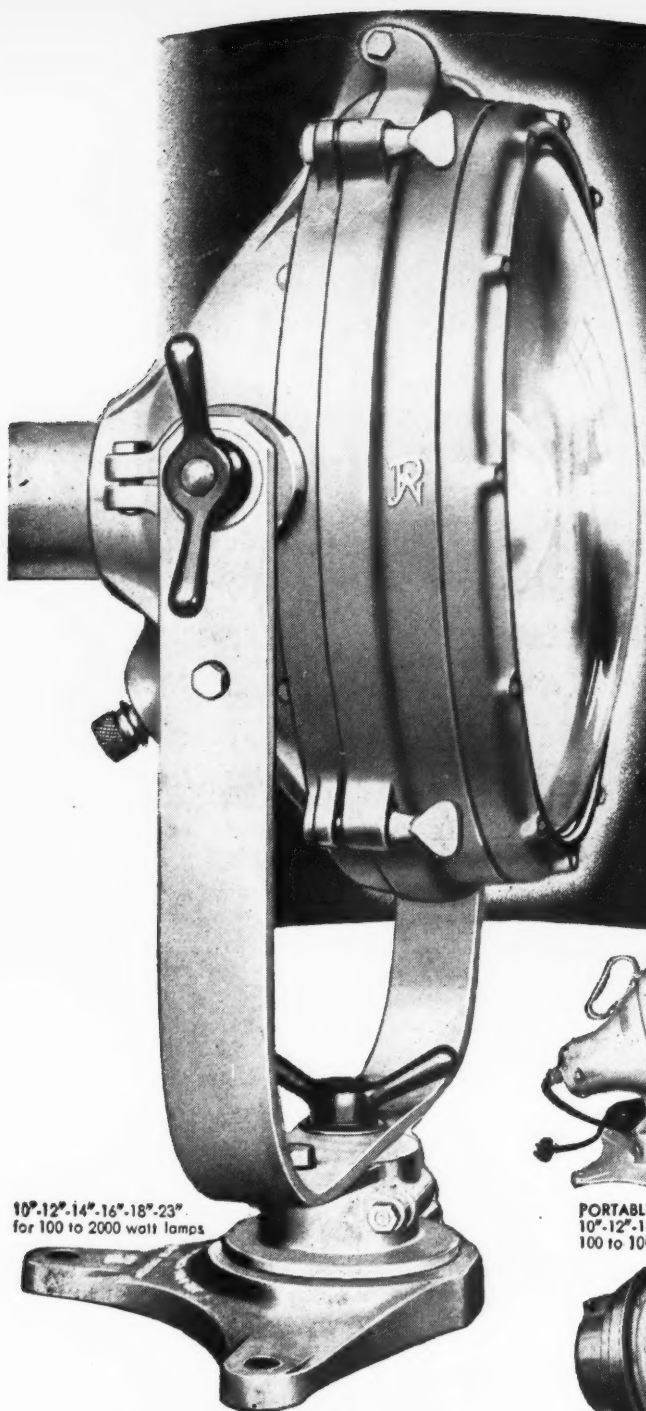
CRESCENT



WIRE and CABLE



CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, NEW JERSEY



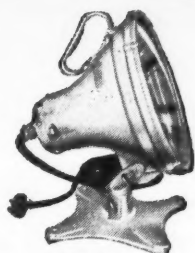
10"-12"-14"-16"-18"-23"
for 100 to 2000 watt lamps

**Dependable
Floodlighting
with Minimum
Maintenance**

Specify

PLYE-NATIONAL FLOODLIGHTS

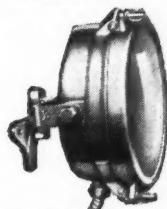
**for Permanent Heavy-Duty
Floodlighting**



PORTABLE
10"-12"-14"-16"
100 to 1000 watts



FLUSH—10" for Pit or
Subway Wall or Ceiling
100-150-200 watts



SHORT RANGE—10"-12"
for Wall Mounting
100-150-200 watts

Pyle-National floodlight equipment is designed and constructed to withstand the most severe operating conditions. Complete range of types and sizes are available.

RUGGED cast aluminum housings with tight sealing doors and door glass joints—positively dust proof and moisture proof—give maximum protection to reflectors and lamps and reduce cleaning and other maintenance to an absolute minimum.

STRONG, galvanized cast iron bases and brackets of many types are provided for simple mounting and accurate adjustment in all locations.

ADVANCED DESIGN of the carefully molded and highly polished reflectors and lenses insure the highest optical efficiency—thoroughly annealed for maximum toughness.

Write for catalog 2100 giving complete information.

The services of our trained and experienced floodlighting specialists are available at all times to advise and assist in installation problems.



THE PYLE-NATIONAL COMPANY

1344 NORTH KOSTNER AVENUE, CHICAGO 51, ILLINOIS

Offices: New York • Baltimore • Pittsburgh • St. Louis • St. Paul • San Francisco • Cleveland

Export Department: International Railway Supply Co., New York • Canadian Agent: The Holden Co., Ltd., Montreal

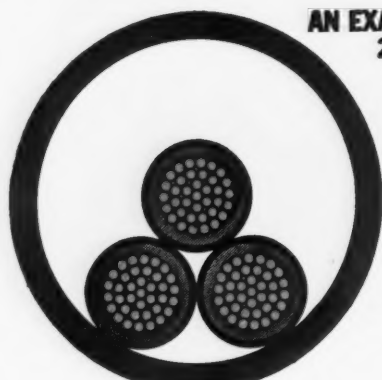
CONDUIT FITTINGS • PLUGS and RECEPTACLES • TURBO-GENERATORS • LOCOMOTIVE HEADLIGHTS • MULTI-VENT

CRESCENT

ENDURITE Type RH

Gives Greater Current Carrying Capacity per Dollar of Installed Cost

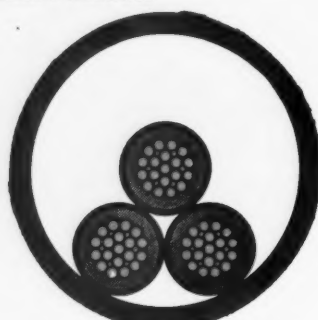
AN EXAMPLE -
200 AMP. CIRCUIT *



250,000 CM

TYPE R

Requires 2½" Conduit. Maximum permissible operating temperature 60°C.



3/0

TYPE RH

Requires 2" Conduit. Maximum permissible operating temperature 75°C.

The superior heat resistant characteristics of CRESCENT ENDURITE INSULATION with its higher permissible operating temperature and therefore greater current carrying capacity, permit the use of a smaller size of conductor, and in most cases smaller size of conduit at less cost than would be required for Type R Wire for the same load.

For light loads requiring small sized conductors, Voltage Drop is the determining factor in choice of wire size. Usually in sizes No. 6 AWG and heavier for power circuits or No. 1 AWG and heavier for lighting circuits, CRESCENT ENDURITE Type RH Wire & Cable gives the lowest installed cost-per-ampere of useful circuit capacity.

**In Accordance with 1947 National Electrical Code.*

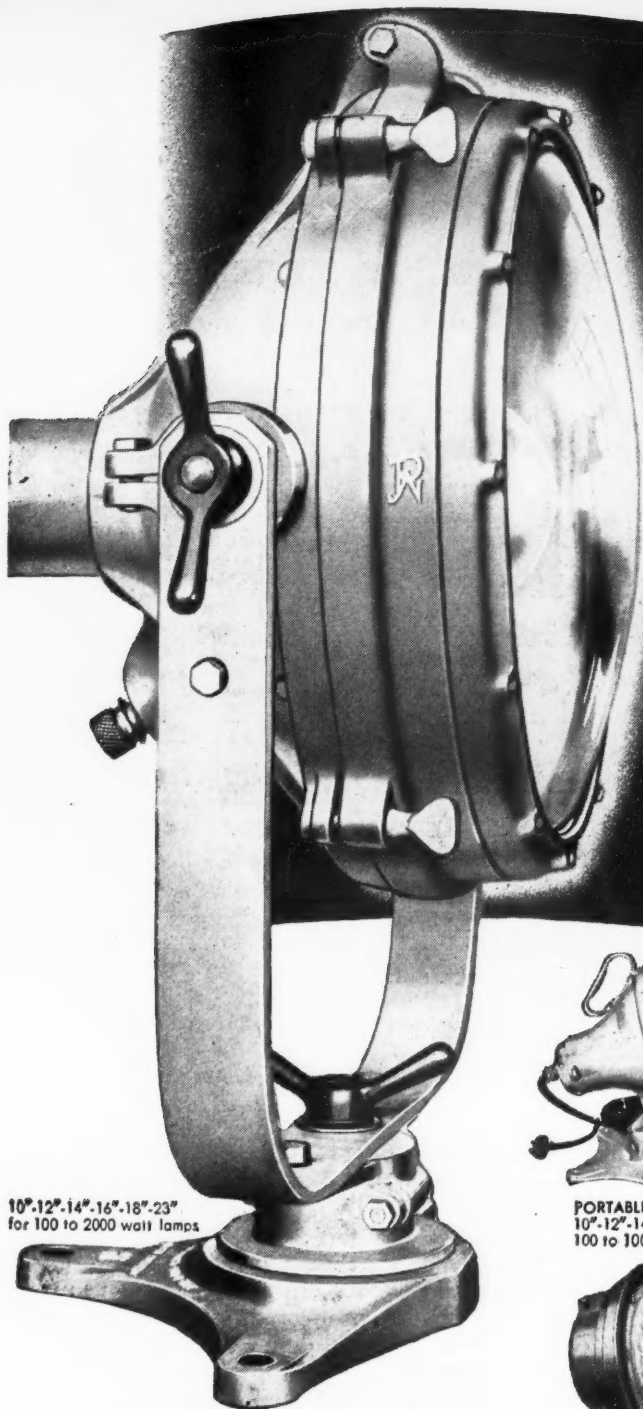
CRESCENT



WIRE and CABLE



CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, NEW JERSEY



10"-12"-14"-16"-18"-23"
for 100 to 2000 watt lamps

**Dependable
Floodlighting
with Minimum
Maintenance**

Specify— PYLE-NATIONAL FLOODLIGHTS

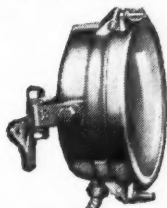
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CONDUIT FITTINGS • PLUGS and RECEPTACLES • TURBO-GENERATORS • LOCOMOTIVE HEADLIGHTS • MULTI-VENT

GREAT NEWS for Electrical Contractors, Maintenance Men, Motor Repairmen, Appliance Men, etc.

THE NEW MODEL 40 UTILITY TESTER



A NEW KIND OF INSTRUMENT FOR TESTING ALL ELECTRICAL CIRCUITS AND APPLIANCES SUCH AS —

- RANGES
- SHAVERS
- HEATERS
- IRONERS
- WASHERS
- FANS
- VACUUM CLEANERS
- AIR CONDITIONERS
- REFRIGERATORS
- SUN LAMPS
- TOASTERS
- WASHING MACHINES
- MOTORS

[ALL MOTORS — single phase, multi-phase, universal, squirrel cage, induction, in fact every type of motor from fractional H.P. to 2 H.P.]

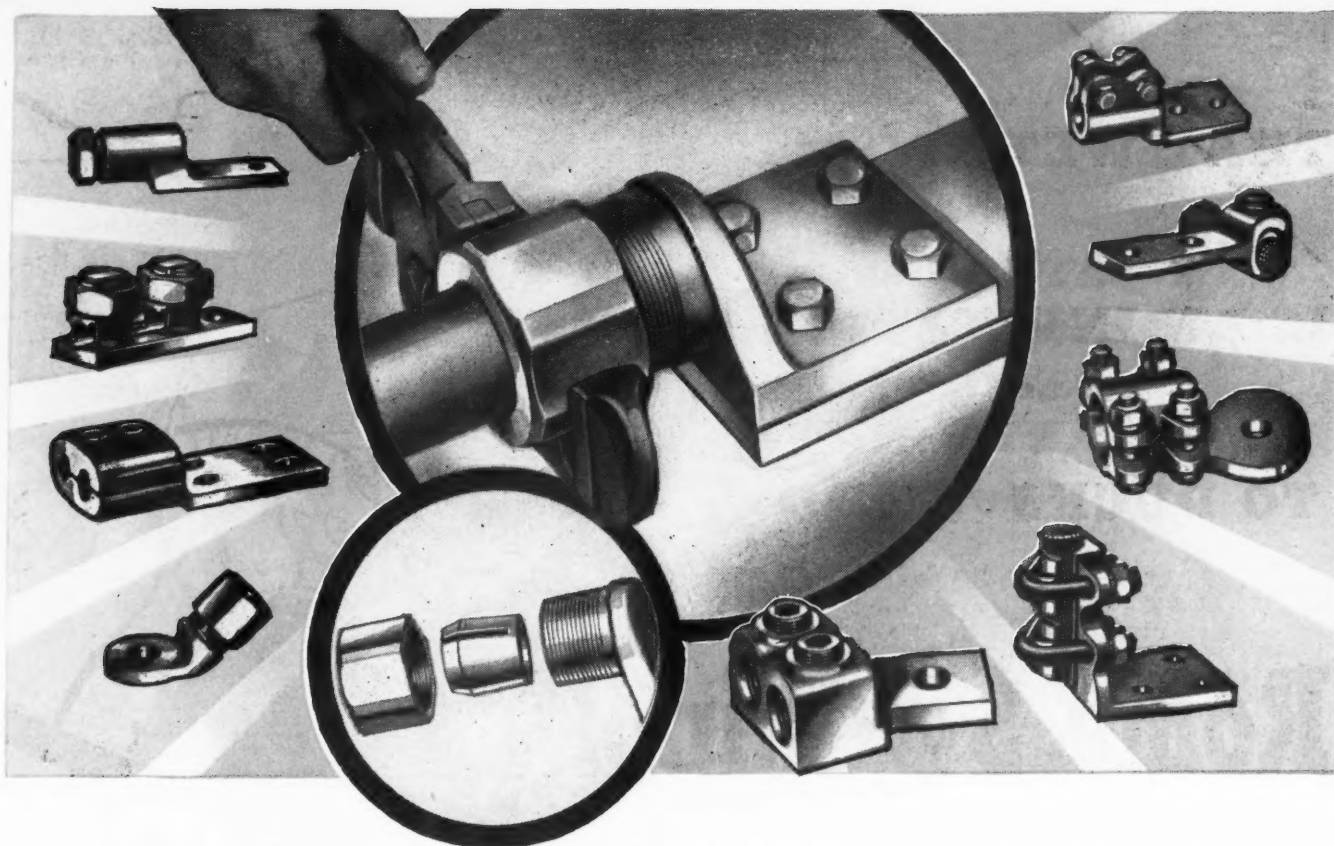
THE MODEL 40 UTILITY TESTER:

- Will test Thermostats under actual working conditions.
- Is the ideal trouble-shooter as it will instantly locate opens, shorts and grounds.
- Will test all bulbs, radio tube filaments, pilot light lamps, all fuses including cartridge, screw, etc., fluorescent bulbs, etc.
- Will test condensers for both opens and shorts.
- Will accurately check and locate the exact cause of failure in 3 way heat control switches.
- Will check field coils for opens and shorts.
- Will indicate when one side of an appliance or motor connected to the line under test is "grounded".
- Will measure the actual current consumption of any appliance or utility either A.C. or D.C. and will measure it while the unit is in operation. The reading will be direct in amperes. The appliance or utility may be plugged directly into the front panel receptacle. A special pair of insulated clip-end leads is included for motors, etc.
- Incorporates an ultra-sensitive direct-reading resistance range which will accurately measure all resistances commonly used in electrical appliances, motors, etc. This range will enable continuity checks and tests for shorts and opens. Will read from a fraction of an ohm to 25,000 ohms.
- Will indicate when a three phase motor is running erratically due to a "blown" fuse.
- Will indicate excessive leakage between a motor and a line up to 10 Megohms.
- Will indicate whether the voltage is 110 volts or 220 volts, if the current is A.C. or D.C. and if the frequency is 25 cycles or 60 cycles.

The Model 40 Utility Tester comes housed in a rugged crackle finished steel cabinet with portable cover, complete with all test leads and operating instructions — only . . .

\$15⁷⁵

GENERAL ELECTRONIC DISTRIBUTING CO.
DEPT. EC-9 98 PARK PLACE NEW YORK 7, N. Y.



You always find the EXACTLY RIGHT TERMINAL—in the Complete line

Shown above, at center, is one of the various Multi-Slit Tapered Sleeve lugs in the Penn-Union catalog. You'll also find E-Z lugs with Post-and-Nut, Vi-tite, Multifit, and numerous clamp types. These pictures can merely suggest the variety.

Below are shown Thread-On, Shrink Fit and screw types, soldering lugs, a wide selection of sheet metal terminals, etc. *Penn-Union makes the terminal you need.*

Also, Tee Connectors; Cable Taps; Straight, Parallel, Elbow and Cross Connectors; Bus Supports, Clamps, Spacers; Grounding Clamps; Service Connectors, etc.

Penn-Union fittings are the choice of leading users, who have found that *if Penn-Union made it, it's dependable* — mechanically and electrically.

Sold by Leading Wholesalers

PENN-UNION ELECTRIC CORP.
ERIE, PA.

Canada: Dominion Cutout Company, Ltd.
250 Richmond St. West, Toronto

The Complete Line of Conductor Fittings

PENN-UNION

THAT WET LOCATION

IS AN INVITATION

TO DUCKS... AND

Rome Synthinol*

TYPE TW BUILDING WIRE



UNDERWRITERS'
APPROVED



*Trademark
Registered

Write for Circular 101, describing
Rome Synthinol Thermoplastic In-
sulated Wires and Cables. It's
yours for the asking.

You can do no better service to your customers than to recommend or install Rome Synthinol thermoplastic insulated building wires, and, at the same time, gain for yourself lasting customer confidence.

Specifically approved by the Underwriters' Laboratories for 600 volt service at 60° C in wet locations, under the rules of the National Electrical Code, Section 3102 b, Rome Synthinol, Type TW, is equally suitable for all general purpose wiring. Its high resistance to oils and greases, acids, alkalies, moisture and flame recommends Rome Synthinol

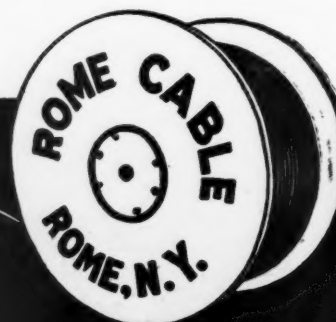
Easy to Pull • Uniformly Small Diameter • Easy to Strip

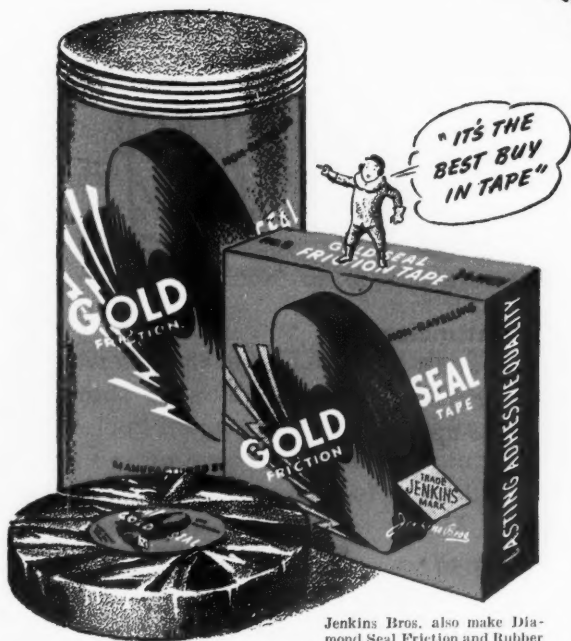
for really severe installation conditions. It is practically unaffected by long time exposure to sunlight. Colors are non-fading and clear . . . there is no outer braid to rot or fray. The smooth, waxed finish provides a non-friction surface for easy pulling.

Rome Synthinol, Type TW, has printed on its surface the name "ROME CABLE," with size, voltage rating, type, and the words, "MOISTURE RESISTANT GRADE." Insist upon wire so printed. It is your assurance . . . first, that you have Rome Synthinol quality and . . . second, that the wire is Underwriters' Approved.

FROM BAR TO FINISHED WIRE

ROME CABLE
CORPORATION
ROME • NEW YORK





Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet ASTM and Federal Specifications.

IF YOU WANT a tape with a grip you can trust—try Gold Seal. Hot or cold . . . rain or shine . . . it sticks to the job—speeds the work. In every electrical field, it's the favorite.

Laboratory controlled production assures the lasting "tack" in the friction compound. And Gold Seal will not dry out, peel, or smear the hands. Its top quality base cloth tears evenly, quickly, without raveling.

Next time try Gold Seal . . . it's the best buy! Conveniently packed in single rolls or handy 10-roll containers . . . each roll cellophane wrapped to reach you factory fresh. Jenkins Bros., (Rubber Div.), 80 White St., New York 13, N. Y.

JENKINS



Gold Seal Tape

FRICTION and RUBBER TAPES

MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES



ASSURING *Top Production* from ELECTRIFIED MACHINES



By integrating the WESTON "per-cent load" ammeter or wattmeter into the machine, designers now make it easy for operators to secure *optimum production* from machine tools and other motor-driven equipment. This instrument continuously provides operators with the following indications:

MAXIMUM SAFE LOAD . . . reduces tool breakage.

CHANGING LOAD . . . indicates need for sharpening or resetting tools, redressing grinding wheels, etc.

OVERLOAD . . . permits corrections before serious troubles occur.

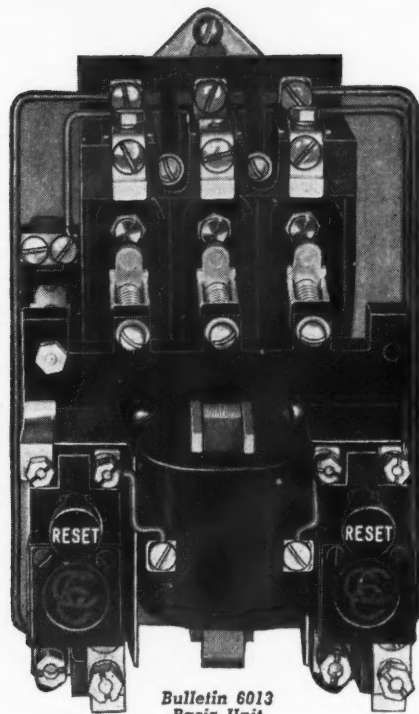
Installed on milling machines, grinders, polishers, turret lathes, automatics, etc., the "per-cent load" indicator is proving a valuable aid in *increasing production . . . providing uniformly high quality with fewer rejects . . . assuring longer life from motors and tools.*

Consult your nearest Weston representative, or write Weston Electrical Instrument Corp., 664 Frelinghuysen Ave., Newark 5, N. J.

WESTON

Instruments

Albany • Atlanta • Boston • Buffalo • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Jacksonville • Knoxville • Little Rock • Los Angeles • Meriden • Minneapolis • Newark
New Orleans • New York • Philadelphia • Phoenix • Pittsburgh • Rochester • San Francisco • Seattle • St. Louis • Syracuse • In Canada, Northern Electric Co., Ltd., Powerlite Devices, Ltd.



Bulletin 6013
Basic Unit

There's a **CLARK** ACROSS-THE-LINE STARTER AND ENCLOSURE For Every Industrial Condition

Shown above is the basic unit of CLARK Bulletin 6013 AC Magnetic, non-reversing, Across-the-line Starters. It provides full voltage starting and overload protection for squirrel cage motors and can be used as a primary switch for wound rotor induction motors.

This starter consists of a CLARK Bulletin 7707 Contactor with double-break silver-to-silver contacts and CLARK Bulletin 7323 Overload Relays which open the contactor coil circuit when an unsafe overload occurs. Contactor and Overload Relays are mounted on a steel mounting plate which is easily removed for service.

Enclosures to meet Every Operating Condition

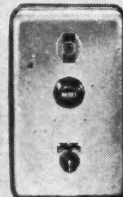
Form MA, MB and MC starters have heavy steel enclosures, with provisions for locking.

Form MA has reset button on cover for externally resetting the overload relay. A separate push button or other pilot device is required for starting.



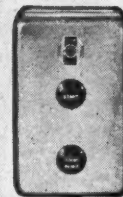
Form MA
Starter

Form MB provides a "Hand-Off" Automatic selector switch and external reset button. It is used with separate 2-wire pilot devices such as float switches, thermostats, etc.



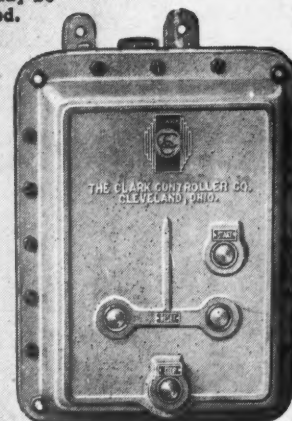
Form MB
Starter

Form MC provides external "Start" and "Stop" buttons, the "Stop" button is also the "Reset" button for external resetting. Separate push buttons are not required for starting, but may be used if desired.



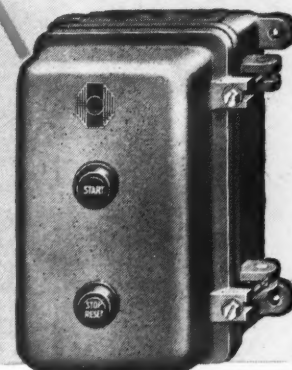
Form MC
Starter

NEMA Type 7 Enclosures for Class 1, Group D Hazardous locations are available for locations where atmosphere contains gasoline, petroleum, naphtha, benzene, alcohol, acetone, lacquer, solvent vapor or other gases from volatile liquids.



NEMA Type 7 - for
Class 1, Group D
Hazardous Locations

NEMA Type 4 Water-Tight, and NEMA Type 5 Dust-Tight Enclosures have gaskets which seal them effectively against moisture or non-explosive dust conditions.



NEMA Type 5 Dust-Tight and NEMA Type 4 Water-Tight

Available Through CLARK Distributors.

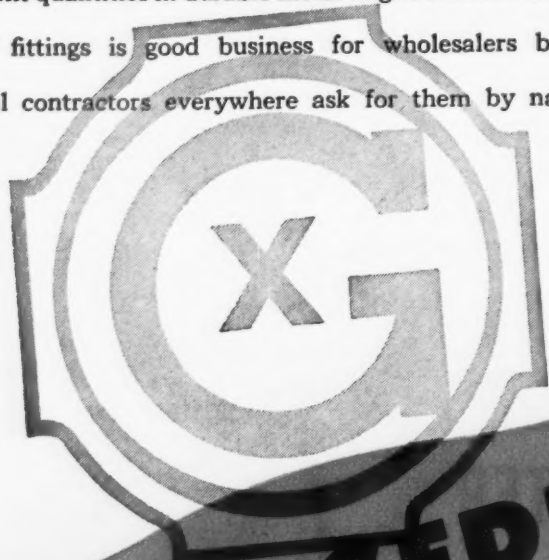


THE CLARK CONTROLLER co.

EVERYTHING UNDER CONTROL • 1146 EAST 152nd STREET, CLEVELAND 10, OHIO

One Hundred Years Experience

When it comes to electrical fittings, a century of foundry experience goes a long way in producing the kind of fittings contractors like to use. Gedney fittings are made of the highest grade, unbreakable malleable iron, smoothly finished and rust-proofed. They are designed to fit the job and packaged in convenient quantities in durable metal-edged cartons. Stocking Gedney fittings is good business for wholesalers because electrical contractors everywhere ask for them by name.



GEDNEY **malleable iron** **FITTINGS**

FACTORY, FOUNDRY AND SHIPPING
POINT - TERRYVILLE, CONNECTICUT

The complete line of Gedney fittings is fully described in the new 62 page catalog. Illustrations and special cross-indexing make it easy to use. Ask for your copy.



GEDNEY ELECTRIC COMPANY, RKO BLDG., RADIO CITY, NEW YORK 20, N. Y.

MAKE SURE OF *Longer-Lasting.*
more Dependable Protection
in your Panel boards

...ALWAYS SPECIFY I-T-E TYPE ET THERMAL CIRCUIT BREAKERS

ALL panelboard circuit breakers may look alike, but only the I-T-E type ET breakers offer you the more rugged construction, the more dependable operation of breakers designed and built by *Switchgear Specialists*.

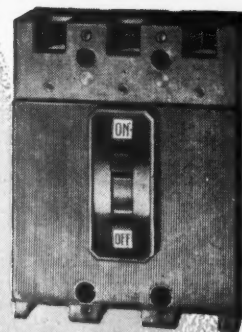
Longer lasting? You bet! All metal parts of type ET breakers are stronger, heavier; they stand up longer under constant use. Higher contact pressures — up to 25% higher — mean that contact temperatures and resistances

are kept to a minimum; contacts have less tendency to oxidize; operate effectively, longer.

And type ET breakers are *dependable*. Exclusive I-T-E thermal elements operate at high temperature rise; keeping derating factors to an absolute minimum.

Next time you need a panelboard, remember this: for longer lasting, more dependable, *more efficient* circuit breaker protection, always specify I-T-E Type ET thermal breakers.

Complete information on I-T-E type ET thermal breakers is contained in catalog 5003. Send for it today. I-T-E will be glad to supply you with the names of panelboard builders in your locality who will furnish panelboards equipped with I-T-E type ET circuit breakers.



I-T-E TYPE ET BREAKERS

TYPE CIRCUIT BREAKER	AMPERE RATINGS	VOLTAGE RATINGS		UNDERWRITERS' LABORATORIES INTERRUPTING RATINGS				NEMA INTERRUPTING RATINGS		STANDARD FEATURES										SPECIAL FEATURES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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THERMAL CIRCUIT BREAKERS

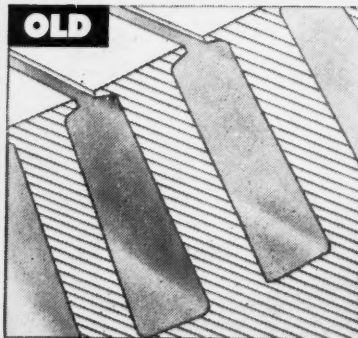
The Leader In Technical Excellence

I-T-E CIRCUIT BREAKER CO., 19TH & HAMILTON STREETS, PHILADELPHIA 30, PA.—31 OFFICES IN UNITED STATES—IN CANADA, I-T-E IS EASTERN POWER DEVICES LTD., TORONTO

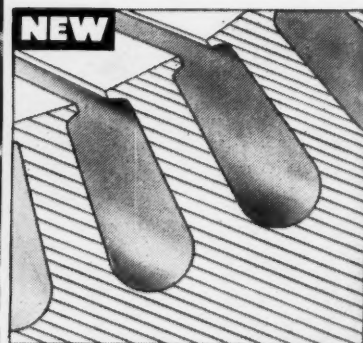


Switchgear • Unit Substations • Isolated Phase Bus Structures • Automatic Reclosing Circuit Breakers • Resistors • Special Products
 * FOR POWER SWITCHING EQUIPMENT, REFER TO RAILWAY AND INDUSTRIAL ENGINEERING CO., AN I-T-E ORGANIZATION

Life-Line..



Usual slot design is rectangular, with sharp corners into which slot cell insulation must be creased and coils must be pushed.



Life-Line slot design is pear-shaped. Coil slips in easily and fills slot—no corner voids remain to collect dirt and moisture.

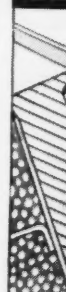
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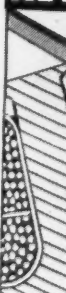


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NEW METHODS...NEW MATERIALS...OPEN WAY TO LONGER ELECTRIC MOTOR LIFE

An electric motor's "muscle" consists of the "sinews", or coils of wire, packed into slots in the stator of the motor.

If these are "bruised", or cramped or damaged while being put in—or if spaces are left for dirt or moisture to gather—protective insulation breaks down and electrical failures result. *Most motor failures are caused in this way.*

Life-Line—industry's all-steel motor—overcomes these common causes of motor failure. New, pear-shaped slots enable coils to be slipped into place without stress, eliminating need for tapping. No slot corners are left to require creasing of the slot insulation, nor to gather dirt in these voids.

New electrical design is just one of the benefits Life-Line motors bring to builders and users of motor-driven equipment. Get the details on Life-Line's smaller size, lighter weight, greater strength and smoothness.

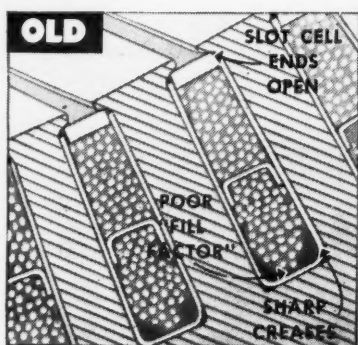
Life-Line motors, now built in sizes from 1-15 hp, are available from stock in standard and near-standard types. "Specials" in Life-Line design are available on short shipment. Other sizes and types—up to 200 hp—soon will be changed over to modern Life-Line design. Check your nearest Westinghouse office for deliveries—or write or wire today to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-21456



Westinghouse
PLANTS IN 25 CITIES... OFFICES EVERYWHERE

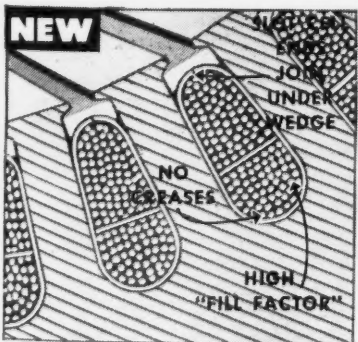
Life-Line motors



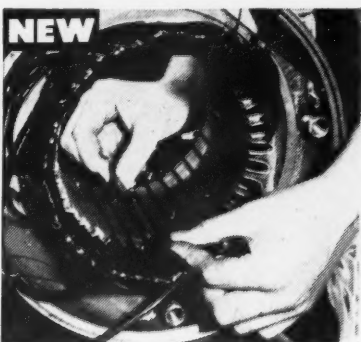
Rectangular slot design leaves many unfilled pockets for dirt, dust and moisture to accumulate and cause deterioration.



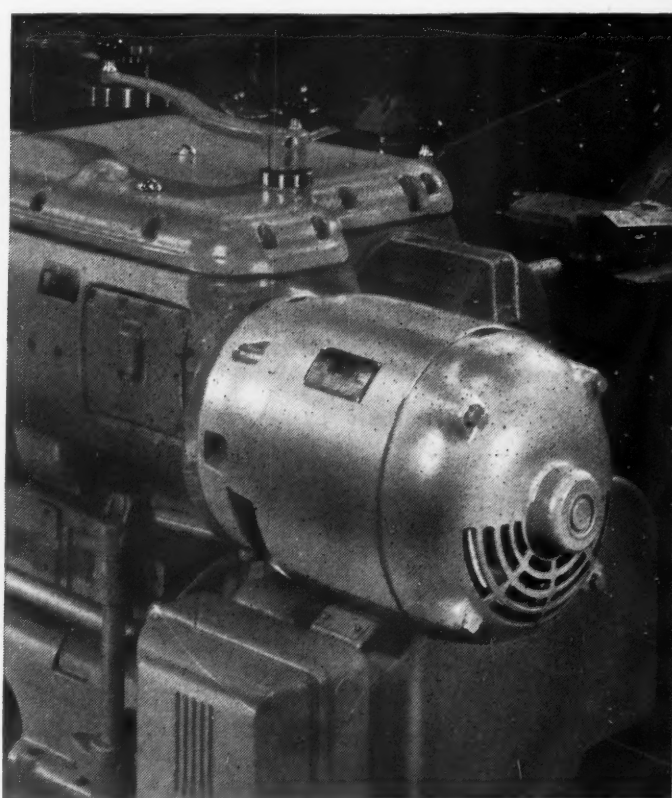
Old slot shape frequently required tapping last wires of the coil into position with resulting possible damage or weakening of insulation.



Pockets are eliminated—cell insulation is lapped over and covered by wedge. No sharp creasing of insulation is necessary.



Life-Line "pear-shaped" slots permit coils to be inserted snugly into position without need for tapping or weakening of the insulation.



LONGER LIFE ON THE JOB with freedom from electrical failures is assured by Life-Line motor manufacturing methods and new insulating materials.

Really Tough



LOOKING FOR A PORTABLE CORD OR CABLE THAT'S REALLY TOUGH?

— One that will stand up under year in, year out exposure to conditions that cut short the life of most cords and cables? Then look to Simplex-TIREX, for only TIREX cords and cables are protected by Selenium Neoprene Armor, cured-in-lead.

Selenium Neoprene Armor is more than "just another" neoprene jacket. It's a special compound, carefully formulated and manufactured by Simplex to provide lasting protection against damage by abrasion, oil, grease, chemicals, sunlight, heat and flame.

The DuPont Company, manufacturers of neoprene, state that "the best neoprene products are made by the best rubber

manufacturers". Simplex's record in the development of rubber compounds is outstanding. But performances in service and test figures also stand as your assurance that Selenium Neoprene Armor is unequalled for dependability and long life where conditions are severe.

All TIREX cords and cables are jacketed with Selenium Neoprene. They are made in sizes and types adaptable to all portable electric tools and equipment. We will be glad to help you select those best suited to your requirements.

SELENIUM NEOPRENE ARMOR

Means

LONGER SERVICE LIFE

From

TIREX CORDS AND CABLES

Simplex-TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

Cost Comparison

The techniques of estimating are usually used to predetermine costs and prices for bidding contract negotiations or job analysis. The goal of such techniques is over-all accuracy in dollars and cents. In planning electrical work, however, it is often important to know the installed cost of alternative methods or materials, as a basis for engineering judgments when job information required for overall accuracy is scant. The techniques of estimating can still be applied to produce useful and valuable information.

Estimating techniques applied to comparisons of alternative methods and materials are less rigorous than those which lead to firm bids. But the cost data derived can be accurate enough to guide experienced judgment in system planning and the selection of materials. Costs of different cables per kva. per 100 ft. can be developed to show comparisons with substantial accuracy for equal conditions.

In the article, "Cost Factors for Cables" on page 49, we begin a series of studies of this type. Your comments will be welcomed.

Jurisdiction

Among the reasons for labor strife, the jurisdictional dispute ranks about the lowest in public sympathy. Jurisdictional strikes are not entirely outlawed by the Taft-Hartley law, but they are made risky and potentially expensive for the participants. But even without a strike, a jurisdictional dispute can throw a well planned job

into red figures with the employer a helpless victim of an arbitrary ruling in which he has no voice in making.

While the machinery is now set up for settling jurisdictional disputes without strikes, the educational process necessary to further engineering progress must go on, or many techniques, such as welding applied to electrical work, may well become useless because of the burden of manpower drawn on strict and logical craft lines that even small operations may have to carry.

Public Protection

The value of certain public records are beyond estimate. So many personal and commercial activities depend upon a host of vital records, licenses and histories stored and handled in public institutions that their protection is of the utmost importance. Effective electrical signal and protective systems are an absolute must for public buildings, new buildings during construction, old buildings as soon as appropriations can be driven through. Modern systems provide effective control, administration convenience and reliable protection. In this issue, A. A. Schuhler reviews up-to-date methods in his article on "Signal Systems for Public Buildings" on page 52.

Underground Maintenance

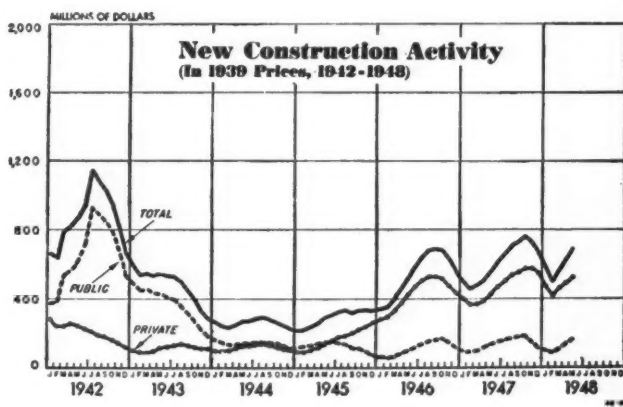
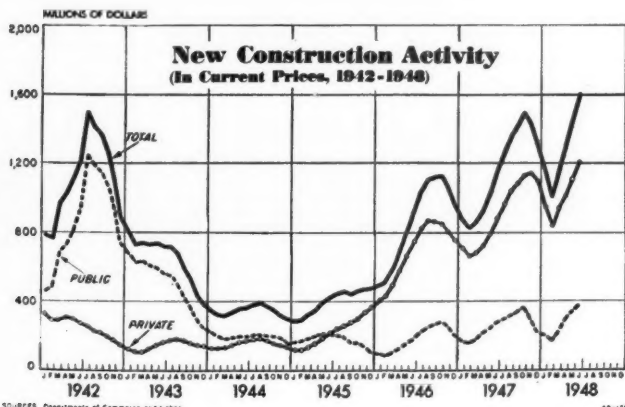
Wiring in underground works has to contend with surrounding conditions which may be many times more severe than conventional systems. To

complicate matters, shock hazards become greater, space is at a premium and continuity of operation is essential. A comprehensive maintenance plan is important on all counts. C. R. Burton, of Oliver Iron Mining Co., highlights the essentials in his article, "Maintenance of Underground Wiring" on page 55.

Planned Lighting Sales

Progress in a practical science is measured more accurately by its use than by its laboratory frontiers. This is particularly true of lighting, since the developmental work on new sources and techniques are stimulated or retarded by public acceptance of the products and methods of the industry. Thus, lighting sales are a critical measure of progress. And lighting sales geared to the best of modern materials and techniques are an urgent goal for all the industry.

Each year at this time we devote an editorial feature section to one of the major aspects of planned lighting. Past sections have been devoted mainly to technology and application. This year our lighting section is devoted primarily to markets and sales methods. The emphasis is deliberate. In many recent conferences with industry groups it is apparent that marketing and sales efforts are far behind current technology. If modern lighting jobs are not always as good as we know how to do, the weakness is in sales strategy more than in technical know-how. We commend "Selling Planned Lighting," beginning on page 57 to your urgent attention.





WHY ANACONDA TOOK THE BRAID OFF TYPE "R" WIRE AND CALLED IT **DURAPRENE**

THE BRAID is gone for good from Duraprene Type "R" building wire. No braid to push back and bunch up . . . mold or rot . . . no asphalt to gum up.

*DUR*Able, neo*PRENE* insulation is where the name *DURAPRENE* comes from. This specially compounded single-wall insulation is inherently resistant to flame and moisture . . . resists acids, oils, alkalis. DURAPRENE offers a smooth, slick finish for easy fishing, is easy to handle and work.

DURAPRENE is approved by Underwriters' Laboratories, marked every six inches for easy identification and available in six permanent colors. Send for descriptive folder DM-4802.

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Duraprene

**SINGLE-WALL NEOPRENE
TYPE "R" BUILDING WIRE**

ANACONDA WIRE & CABLE COMPANY, 25 BROADWAY, NEW YORK 4, N. Y.

NEWS ABOUT DURAPRENE

Dielectric Strength

After 12 hours immersion in water, DURAPRENE has an average voltage breakdown twice that of standard building wire.

Tensile Strength

In the laboratory test, in which the wire is compressed until the copper is grounded, DURAPRENE averages twice the value of standard building wire.

High Temperature Resistance

At a recent exhibit, DURAPRENE was immersed in molten solder (approx. 400° F.) for 30-60 seconds. Taken out and tested, the DURAPRENE was found to have altered little in appearance and retained remarkable tensile strength.

Weather Resistance

DURAPRENE has excellent weathering properties, hence it can be safely used outdoors.



COMPETITIVE BIDS

ADVERTISED JOBS are attracting longer lists of bidders on the electrical work. Competition is sharpening as the winter dip in construction nears, and some low bids are disturbing even the old timers.

FOR MANY YEARS now a great bulk of electrical work has been negotiated by other means. During that time new companies have been formed. Little firms have grown big. Experienced personnel has moved around. Expediting and ingenuity took the lead as dollar-and-cents management skill and personnel teamwork dropped into a secondary role.

SO ESTIMATING SKILL is again important when business volume is at an all time high and trained estimators are probably at an all time low. Further, many of the vital factors in cost prediction are new and difficult of appraisal by even the most experienced organizations. It is not surprising that some current bidding is hog-wild.

THE COST of ignorant bidding has always been a serious burden to the industry. Jobs which should be adding to progress and prosperity are easily spoiled. And it takes only one firm hell-bent for bankruptcy to wreck sound industry relations in a whole community. Bid panics under present conditions are very unlikely but bad estimating is still costly.

RETURN TO COMPETITIVE bidding is a perfectly normal trend as the emergencies of war, reconversion and postwar readjustment disappear. It should involve no improper business risks. Business opportunities in construction, in rewiring, in lighting modernization, in house wiring and every other phase of electrical work are enough to challenge the full abilities of the industry.

CAUTIOUS ESTIMATING is strongly indicated today. Firm bids mean tying up management, men, materials and tools for future periods at considerable risk. Prices and practices are in flux. Stable conditions which provide the basis for critically accurate estimating are not yet established. And these are conditions which need the most objective estimating skill, detailed job analysis, and critical appraisal of potential risks.

COMPETITIVE BIDDING is a contest. There is always the compulsion to "meet" the lowest bids. But some current low bids look more like bad estimating than old fashioned aggressive pencil sharpening. It is going to take an era of hard experience with firm prices to find prudent bidding levels.

Wm. J. Stuart



LIGHT

to please your customers!

You're sure "via Graybar"

Graybar has the biggest selection of lamps and lighting units available anywhere. They're all dependable products of leading manufacturers. So you can eliminate "shopping around," by standardizing on Graybar as your source of lighting equipment for all your customers' needs. You're sure of getting satisfactory units, and on-time deliveries as well.

Real Planning Aid

A Graybar Lighting Specialist will gladly give you all the help you want in analyzing your customers' illumination needs and in planning the best systems to meet them. His know-how is backed by Graybar's experience in studying, planning, and supplying lighting systems of every type since Edison invented the light bulb.

Everything for Contractors

From this one source—Graybar—you can get not only everything for lighting (including switches, ballasts, wire, and conduit), but also everything your customers need for ventilation, signaling and intercommunication, power, wiring—plus electrical contractors' tools!

Your Graybar Representative, or our nearest office, is your easiest source of up-to-the-minute facts about anything for electrical construction or maintenance.

Local Deliveries

Many of the items you need are in stock at our nearest warehouse and will be delivered promptly wherever you specify. Graybar Electric Company, Inc.

Executive offices: Graybar Building, New York 17, N. Y.

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You get the best of
everything electrical
Via **Graybar**

OVER 100 PRINCIPAL CITIES

Cost Factors For Cables . . . Part I

First of a series of articles exploring installed-cost relationships between types of wire and cables used in power distribution systems.

By H. J. Finison*

FREQUENTLY in the preliminary layout of a power distribution system, it is necessary to compare the costs of several methods of accomplishing the desired result. These estimates usually need not be made with an accuracy approaching the precision required for bidding purposes. But, the estimates should have reasonable accuracy in order not to be misleading. The estimates must be made with a minimum of engineering effort in order to encourage better consideration of a number of possible plans.

Making cost estimates for electric power cable installations has been particularly troublesome. Any estimates must include all of the items of cost, including the necessary materials and installation labor. For cable estimates, the cost of the cable itself can be established accurately. However, it is usually not possible to determine accurately the cost of the conduit materials, including fittings and hangers and the cost of installation, until the final build-

ing plans have been completed. This is particularly important because the items of conduit material and labor are a major part of the total installation cost. Yet, cost estimates must frequently be made (for the preliminary engineering planning) considerably in advance of good information on building layout or construction.

The purpose of this article is twofold: (1) To provide data for preliminary estimating of low voltage power distribution cable, and (2) to present a general discussion of factors influencing the choice of cable size.

The article will present information applying to power distribution cable operating at voltages of 600 and below on 3-phase, 3-wire distribution systems. Typical use would be for feeders from load-center unit substations to supply loads in factory areas, Fig. 1.

Types of Cable

Estimating data is presented for the types of cable commonly used for

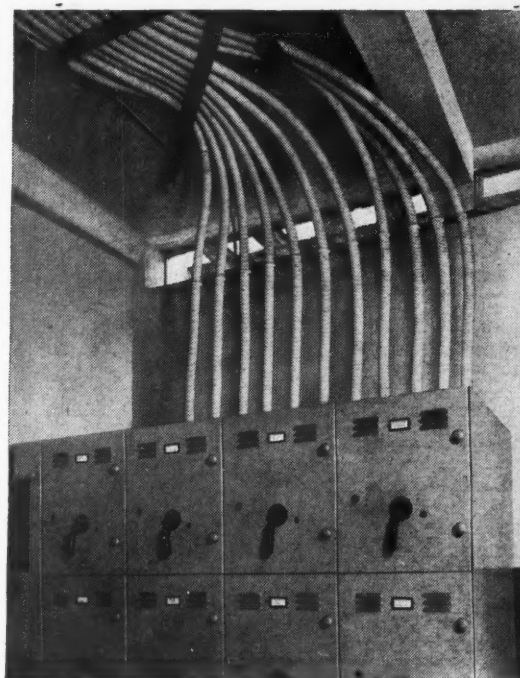


FIG. 1—Interlocked armor power cable leaving metal enclosed circuit breakers of a unit substation to feed factory loads.

power distribution in industrial plants, described in Table 1. Fig. 2 gives the usual application for these cable types.

This article will not attempt to compare the cable types with regard to their suitability for particular applications, although the resulting cost data gives one important factor for comparing them. This, however, is not the primary purpose of the data presented. Rather, the study is intended for use in obtaining comparisons of different methods of distributing power where differing amounts or sizes of cable are used.

Cost of Cable

The cable prices used for this study are based on the selling price of the cable, including freight to the Midwest. A minimum length of cable in one order of 2500-5000 feet (depending on cable type) is assumed. For cable installed in conduit, three single-conductor cables are used since this appears to be the more general practice. Three-conductor cable is used for the interlocked-armor type. A 10 percent addition is made to all cable to allow

* Industrial Power Division
Industrial Engineering Divisions
General Electric Company
Schenectady, New York

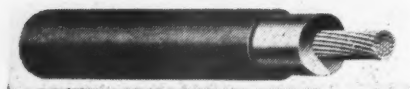
TABLE I

Description of 600 Volt Power Cables Commonly Used in Industrial Plants

General Electric Cable	Insulation	Outer Covering	NEC Type Letter*	Trade Name	Maximum Conductor Temperature Degree C
Code Rubber	Code Rubber	Fibrous covering or lead sheath	R	Code Rubber	60
Versatol-Geoprene	Versatol heat and moisture resistant rubber type compound	Geoprene-60 per cent neoprene compound	RH	Heat Resistant	75
			RW	Moisture Resistant	60
Flamenol	Flame retardant thermoplastic compound	None	T	Thermoplastic	60
Varnished Cambric	Varnished Cambric	Fibrous covering or lead sheath	V	Varnished Cambric	85
Interlocked Armor	Varnished Cambric	Fibrous covering and steel interlocked armor	ACV	Interlocked Armor	85

*This addition of the letter L as a suffix indicates an outer covering of lead

CODE RUBBER—Type R
Lowest cost cable (not shown here)



VERSATOL GEOPRENE

As Type RH—Has superior heat aging qualities. High current carrying capacity. For use in conduit or open wiring

As Type RW—Superior moisture resistance. For use in wet locations in conduit, ducts, or open wiring

Also may be used for direct burial



FLAMENOL—Style FL (Standard Wall)

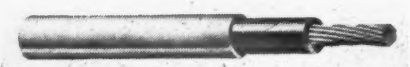
Type T or TW

Resists oil acids and alkalis. For use in wet or dry locations in conduit, ducts, or open wiring



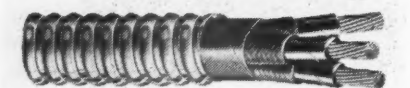
VARNISHED CAMBRIC BRAIDED

Type V—High current carrying capacity and long life. For use in dry locations in conduit or open wiring



VARNISHED CAMBRIC LEADED

Type VL—High current carrying capacity and long life. For use in wet or dry locations in conduit and ducts



INTERLOCKED ARMOR—Type ACV

High current carrying capacity for use in dry locations. Easy to install

FIG. 2—Types of cable commonly used in electric power distribution systems at 600 volts and below.

for shrinkage, waste, and for making up terminations.

Conduit Materials

The cost of conduit and fittings will vary, depending on the nature of the run as it influences the number of bends and fittings required. A typical 100-ft run, using the material listed in Table 2, is assumed for this study. A suitable conduit size, as prescribed by

TABLE 2

CONDUIT MATERIALS FOR 100 Ft RUN

100 ft Conduit
3 Elbows
15 Couplings
10 Supports
10 Anchors
2 Locknuts
2 Bushings

Note: Prices for above based on prices in effect Sept. 1, 1947 including freight to Midwest

A mark-up of 10 per cent is assumed on above materials for handling costs and return (profit)

TABLE 3

REQUIRED CONDUIT SIZE FOR 3 CABLES

Size	Conduit Size for 3 Conductors	
AWG or MCM	Non-Leaded Types R-RH-T-V	Leaded Types RHL-VL
8	3/4	1 1/4
6	1	1 1/2
4	1 1/4	1 1/2
2	1 1/4	1 1/2
1	1 1/2	2
0	2	2
00	2	2
000	2	2 1/2
0000	2 1/2	2 1/2
250	2 1/2	3
350	3	3
500	3	3 1/2
750	3 1/2	4
1000	4	4 1/2

Source: National Electrical Code, 1947

TABLE 4

INSTALLATION COSTS

Direct Labor	\$2.00 per hour*
Percentage additions on direct labor	
Insurance, tools, and other direct job costs	
Overhead on labor	
Return (profit)	
Total	38.5 per cent

*Engineering News Record reported an average wage rate for skilled construction labor of \$2.01 per hour for June, 1947

the National Electrical Code and summarized in Table 3, is used.

Installation Costs

The cost of installing the conduit and cable will also vary with the type of the building construction and the nature of the cable run. Data on man-hours required to install cable and conduit has been obtained from a number of sources. The information for installing the conduit is plotted on Fig. 3 and an average curve drawn to represent typical values.

Data on labor required for pulling the cable into the conduit has been taken from one source in order to preserve the comparison between leaded

TABLE 5

Estimated Installed Cost for Typical Cables for Power Distribution in Industrial Plant

Dollars per 100 ft of 3 Conductor run

Size AWG or MCM	Code Rubber Type R	Versatol-Geoprene Type RH	Flamenol Type T	Varnished Cambric Braided Type V	Varnished Cambric Leaded Type VL	Interlocked Armor Type ACV
8	64	75	71	70	122	
6	81	96	90	91	151	
4	104	124	117	116	164	102
2	118	144	137	131	182	124
1	145	171	172	160	236	140
0	183	211	215	196	250	168
00	198	227	230	213	270	187
000	216	240	255	237	338	213
0000	281	311	326	304	364	262
250	304	340	360	333	468	296
350	400	446	472	436	531	378
500	472	528	572	522	694	469
750	669	748	812	844	948	638
1000	854	951	1050	944		

TABLE 6

Allowable Current Carrying Capacity in Amperes of 600 Volt Power Cables

Not more than 3 conductors in conduit or cable. Based on ambient temperature of 40 C (104 F)

Size AWG or MCM	Type R Code Rubber 60 C	Type T Flamenol 60 C	Type RH Versatol-Geoprene* 75 C	Type V Varnished Cambric 85 C	Type ACV Interlocked Armor 85 C
8	33	33	40	45	
6	45	45	57	63	
4	57	57	75	81	91
2	78	78	101	108	121
1	90	90	114	126	139
0	103	103	132	140	161
00	119	119	154	166	185
000	135	135	176	189	213
0000	160	160	202	212	244
250	176	176	224	243	270
350	213	213	273	292	334
500	262	262	334	364	417
750	328	328	418	450	529
1000	373	373	480	526	

*Versatol Geoprene when used as Type RW is rated at 60 C, use Flamenol ratings

Ratings given for Types RT, RH, and V are as given by the National Electrical Code, 1947

Ratings given for Type ACV are as given by the Insulated Power Cable Engineers Association, based on better cooling obtained by use of interlocked armor cable

and nonleaded cable types, as shown in Fig. 4. However, this information has been checked with several other sources.

Labor Cost

Labor costs are based on an average labor wage rate for June, 1947, with mark-ups for tools, overhead, and contractor's return, as summarized in Table 4.

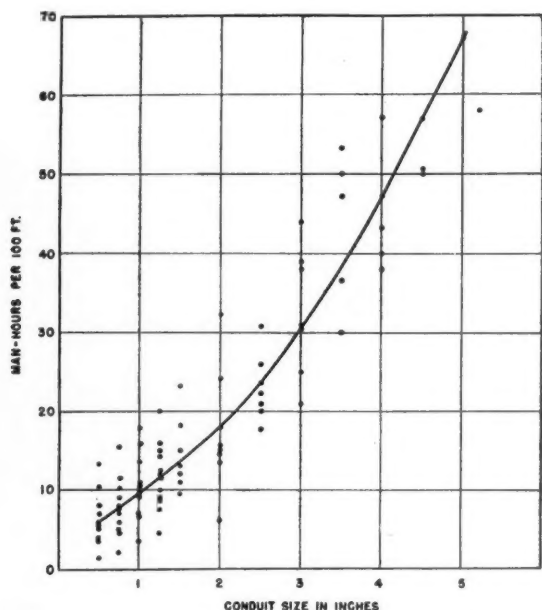


FIG. 3—Labor required for installing conduit and fittings in typical factory buildings.

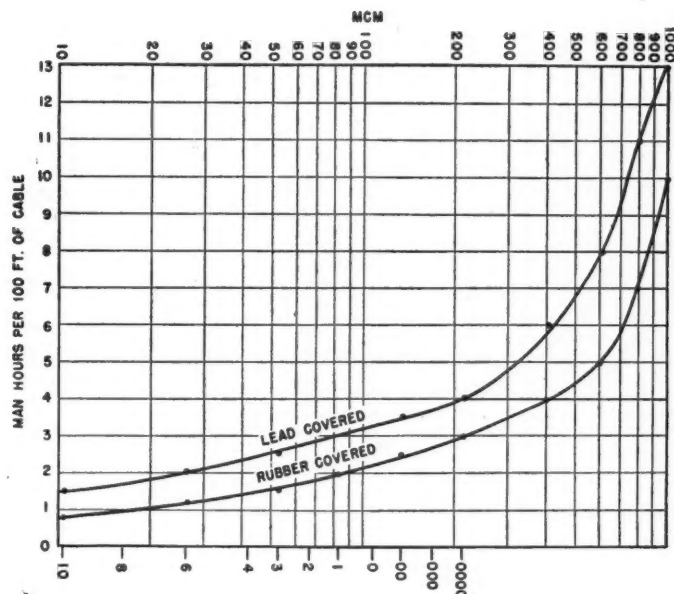


FIG. 4—Labor required for installing cable in conduit.

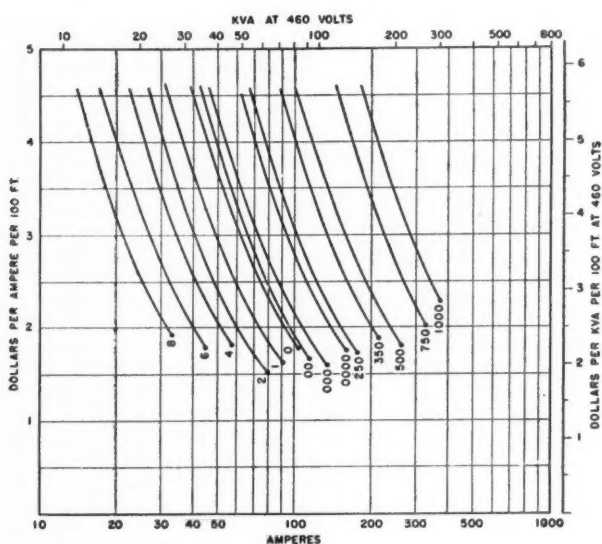


FIG. 5a. Installed cost. Type R 600-volt power-cable. Three single conductor cables in steel conduit

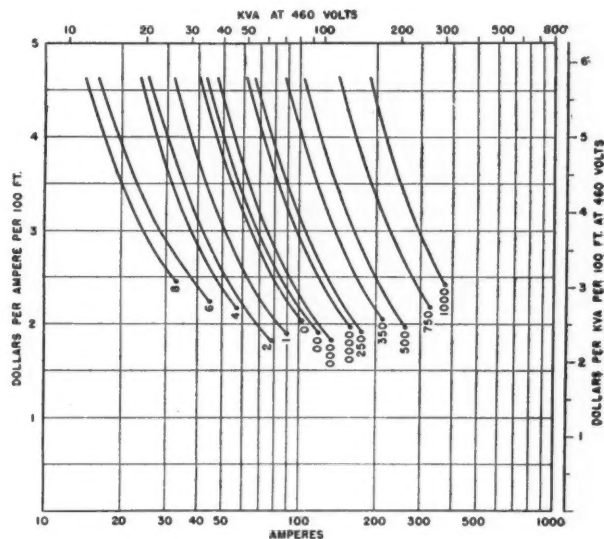


FIG. 5b. Installed cost + capitalized losses Type R 600-volt cable. Three single conductor cables in steel conduit

FIG. 5—Cost estimating data for low voltage power distribution cable. (Includes all material and labor for installing in a typical factory building. Numbers on curves are cable size AWG or MCM).

Interlocked-Armor Cable

Experience of a number of contractors has indicated that the cost of installing interlocked-armor cable is less than one-half that for cable and conduit. The cost estimates presented for installation materials and labor for interlocked-armor cable are, therefore, assumed to be one-half the total conduit material cost and conduit and cable labor cost for installing conduit and three-single conductor rubber-covered cables.

Total Installed Cost of Cable

Table 5 gives a summary of the in-

stalled cost of the several cable types obtained by a combination of the estimating data just described.

Current Carrying Capacity

The allowable current carrying capacity for the cables studied is given in Table 6.

Unit Installed Cost of Cables

The unit installed cost of Type R cable in terms of dollars per ampere is given by Fig. 5a. This chart was derived by dividing the installed cost of the cable by allowable current values for the cable up to the maximum per-

missible current at the cable rating. Thus, the dots at the end of each curve represent the limit of the curve, since any additional current would exceed the cable rating. Similar charts for the other cable types will be presented in Part II.

The charts are now in a useful form for cable estimating. For example, assume it is desired to supply a load of 200 amperes at a distance of 200 feet from the supply transformer. If type R cable is used, Fig. 5a will give the estimating data. At 200 amperes the lowest cable curve is the 350 MCM

[Continued on page 204]

SIGNAL SYSTEMS FOR PUBLIC BUILDINGS

Control, administration and protection of public buildings
require effective electrical signal installation.

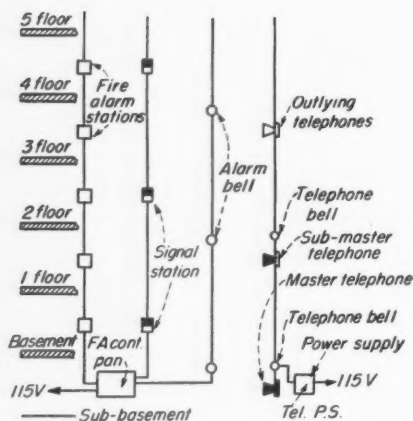


FIG. 1—Typical fire line and telephone system riser diagram.

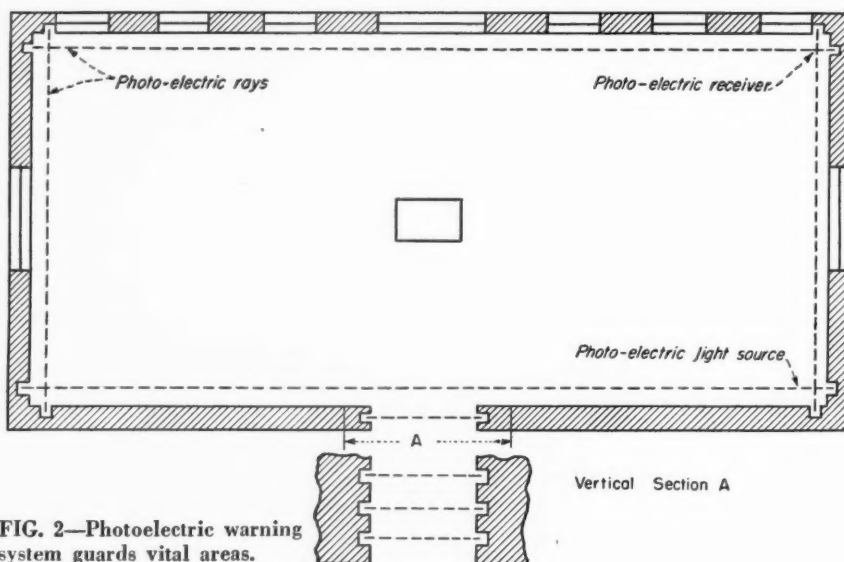


FIG. 2—Photoelectric warning system guards vital areas.

MODERN public buildings, whether located in large or small cities or in county seats or townships are faced with similar basic problems insofar as protection and expediency is concerned, the chief difference being in the extensiveness of the requirements. In this category may be considered administration buildings such as town halls, city halls and state capitols; archives buildings or halls of records; correctional institutions such as jails, prisons and penitentiaries; court houses; libraries; memorials; museums; office buildings; post offices.

The contents and the records in many of these buildings are considered very valuable and in most cases are not replaceable and therefore warrants the best and most complete protection. This would include any possible attack from those of criminal intent, either within or outside of the building, who by means of force wish to acquire any part of its contents. Likewise, thorough study must be given to the matter of possible fire hazards and methods of detecting a fire at the incipient stage

By A. A. Schuhler

where time is of great importance.

In the matter of correctional institutions, the main object is to prevent the escape of those committed to them. Extensive systems to indicate occupancy of the rooms and cells, or to secure assistance and to notify guards at key points in the event of attacks or riots are of vital importance.

The types of systems used in public buildings may be divided into two major groups. First, the protective and second, the personnel. The systems used for protection are the cell and room alarms, fire alarms of the manual and automatic type, fire line signal and telephone systems, guard house alarms, metal detectors, protective alarms, riot alarms, smoke detection systems, sprinkler alarms and watchmans' tour systems. The systems used by the personnel are call systems, clock systems, dismissal signals, door signals, photo-electric door controls, elevator signals and telephones. Occasionally

public address systems are installed where large gatherings occur.

Cell alarm systems are used in certain correctional institutions in order to signal the section or block guard when an inmate, usually a trusty, has left and returned to his cell. Such a system is composed of door contact switches, one for each cell or room and a lamp annunciator at the section guard post with an indication for each room. A small bell or buzzer is added as an audible signal within the annunciator case. Occasionally signal lamps are located in the corridors above the room doors which operate with the individual room signal in the annunciator. Each section or block annunciator may be piloted by a common lamp in the master annunciator at the chief guard's station.

Fire alarm systems of the manual type should be installed in all public buildings for the protection of the general public who may visit them, and for the people who are employed or committed therein. The prime object being to evacuate the buildings, in the quick-

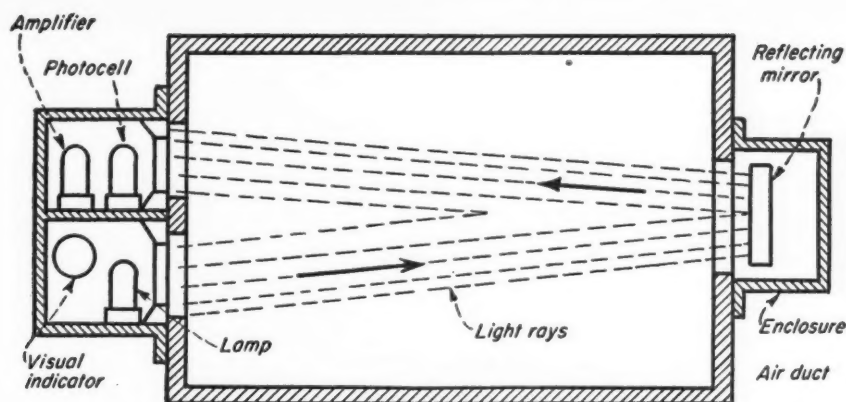


FIG. 3—Electronic photoelectric smoke warnings are installed in air ducts.

est time possible. Such systems are composed of plain code, shunt non-interfering or positive non-interfering fire alarm stations generously distributed at strategic points and in the path of escape, a sufficient number of alarm bells to be distinct and clearly audible by all concerned, and the associated closed-circuit supervised control panel to assure proper operation of the system.

Fire alarm systems of the automatic type should be installed at all points where records, files, collections and exhibits are kept, shown or stored. These systems are operated thermostatically either on the principle of fixed temperature or rate-of-rise or both. These systems are composed of a quantity of equally distributed thermostatic detectors grouped into zones and wired to annunciator control boards, or electrically tripped transmitters, or consist of one or more loops of small metal tubing run throughout the protected area and terminating at one detector for each zone. These transmitters, annunciator control boards or detectors may be connected to any signal such as bells, horns and the like or may be interconnected with a manual fire alarm system.

Fire line signal systems are similar to standard coded fire alarms of the closed-circuit type with the addition of manually operated signal stations which are installed on alternate floors of tall buildings. These manual stations are composed of closed-circuit strap keys which are to be used exclusively by members of the fire department in order to transmit signals to the pump room. The coded and manual stations are all connected in series. The bells are the standard single stroke type and are located in the pump room, elevator shafts and at all points required by the local fire prevention authorities. This feature may also be added to pre-signal fire alarm systems in which case the initial operation of the pre-signal

station transmits the code signals on the fire line or pilot bells. The second operation of the pull lever in conjunction with the insertion of a special plug or key will operate the general alarm on all bells in the system.

Fire line telephone systems are composed of a master station telephone located in the pump room, sub-master station telephones located in auxiliary pump rooms and building entrance, and outlying telephones located on alternate floors. These systems are of the common talking type. The master and sub-master telephones are provided with pushbuttons to selectively call each other. The master station is also provided with a loud-speaker type receiver mounted into the instrument housing. A handset is provided with a long extension cord which will enable the operator of the pump to remain at his post. Vibrating bells of six inch size are used as the audible signal on these telephones. The outlying telephones are provided with pushbuttons for selectively calling the master and sub-master telephones. A typical riser diagram of a fire line signal and telephone system is shown in Figure 1.

Guard house alarm systems are composed of a series of signal stations located at each guard post on the ground level, towers or walls. These stations contain a pushbutton, a bulls-eye and necessary control equipment so that scheduled signals may be transmitted from one point to another and in sequence to the chief guard to indicate that each guard is at his post and that no danger exists. A second pushbutton on these stations is used to transmit an emergency alarm.

Metal detectors are built into door ways and corridors in order to determine whether or not individuals are carrying metal on their person. This system operates on the magnetic field principle and causes the control apparatus to operate so that an alarm

may be transmitted to the proper authorities.

Protective alarms are provided in numerous forms. Those used to protect doors, windows, floors, ceiling etc. have been outlined in previous articles. However, in providing protection in museums for example, modifications and refinements are made so as to apply them to various types of exhibition cases and works of art. Photo-electric systems may be employed to protect certain interior areas from any possible attack, likewise this form of protection may also be used to protect the glass roofed areas from possible exterior attacks. Signals are transmitted to the guard room and guard posts, and are often relayed to the police as an added measure of security. A typical photo-electric system layout is shown in Figure 2.

Riot alarms are primarily used in jails, prisons and penitentiaries and are chiefly composed of a series of bells distributed at such points so as to attract the attention of the guards to an emergency. These bells are operated by means of pushbuttons, foot-rail switches or knee contact switches. All of these systems should be of the closed-circuit supervised type to insure proper operation.

Smoke detection systems are composed of photo-electric rays installed in air ducts to transmit an alarm when smoke is visible therein. In addition to giving an audible alarm, provision may be made for disconnecting the air blower motor and to close dampers in various parts of the duct system to prevent spreading of the smoke or fire

[Continued on page 206]

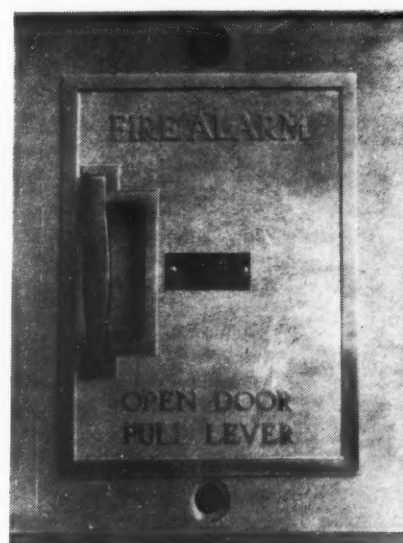
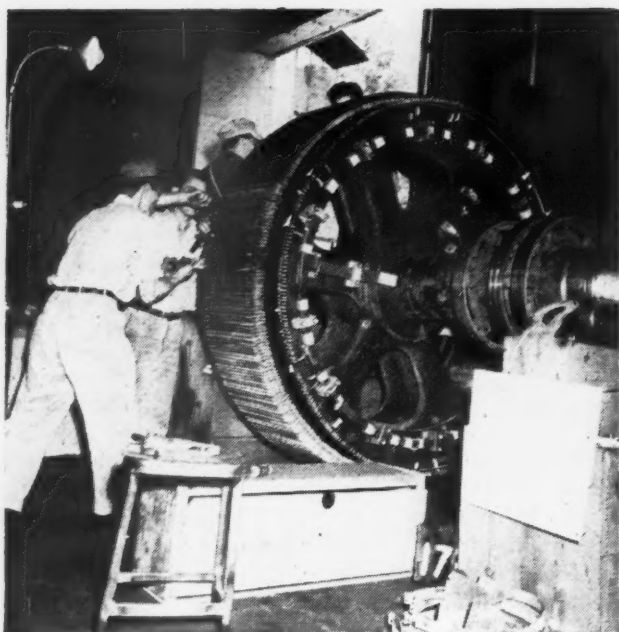


FIG. 4—Typical combination fire alarm and watchman's station.



SHAPING COILS on the 8-ton rotor, which is mounted on special roller bearings. At right, mounted on blocking, is coil diagram for convenient reference.



THREE men worked simultaneously on the stator, two at taping stubs and one forming jumpers.

AN OUTSTANDING accomplishment in motor winding, from the standpoint of the time element involved, was that of the R. A. Reed Electric Co. of Los Angeles, on a 1500 hp. wound rotor induction motor belonging to the Columbia Steel Co. of that city. The job was handled in connection with Bechtel Bros. Corp., which is making the frequency changes on industrial equipment, to 60 cycles, in southern California.

The motor was to be delivered to Reed at 3:00 P.M. on a Sunday afternoon and was to be back, installed and running a week from the following Wednesday. Bechtel was to remove the motor from its base, transport by truck both ways, and reinstall and line up for operation. The time allowed for Reed's part of the work was from 3:00 P.M. Sunday until 12 midnight a week from the following Monday, or 8 days and 9 hours. That they missed it by 30 minutes and did not have it ready until 12:30 simply is an indication of the minuteness of the time tolerance to which they were working.

The principal work was to strip and rewind both rotor and stator. The rotor had 360 slots, 720 bars and 360 coils. Coil span was 1 and 19, connected 4 star. The stator had 216 coils, coil span 1 and 11, connected 4 delta. The stator bore was 69 $\frac{3}{4}$ inches and total iron stackings 18 $\frac{1}{2}$ inches.

Bechtel engineered the rewinding

1500 HP. REWIND

How a Los Angeles shop rewound a 1500 hp. wound rotor motor in 8 days, 9 $\frac{1}{2}$ hours.

for the 60 cycle frequency, changing from 16 to 20 poles, both rotor and stator. When the motor was received, it was found that Reed had rewound it once, about eight years before, therefore, there were data on file to check against the Bechtel figures for the new and altered winding. The first thing that Reed did after the data were all assembled was to make a complete diagram of the whole job and have it blue-printed. This took some hours but greatly expedited the work, particularly on the rotor. It is estimated that the drawing saved at least three days' time on the job. Briefly, the work was done as follows:

Rotor bars were cut at one end with a Skilsaw portable metal-cutting saw. This allowed pulling the bars out of the slots, it being a closed-slot type of rotor.

By means of portable gas burners, the rotor was burned for about twelve hours. The coils were then pulled through the sections of the rotor by using the crane.

The next operation was the removal

of the connection ring assembly. It was then reinsulated and reformed according to the pre-engineered plan in such a way that after the coils were inserted in the rotor there was no connection work necessary, as each coil was formed to fit in its exact location and all group coils fell right into the connection lugs previously spaced on the connection ring.

The stator was stripped, cleaned and rewound in approximately five days. This was possible because of the previous engineering work done on the making of the coils, and the layout diagram.

The rotor and stator ends of the job were worked at the same time, using three 8-hour shifts of three journeymen on each. When the stator was done, the men on that part were shifted to work elsewhere in the shop.

In addition to the journeymen, three helpers were used on each shift, performing various jobs such as separating and laying out coils, taping at different points, cutting top sticks and insulation, etc.

MAINTENANCE of Underground Wiring

**Electrical continuity steps up production and
reduces accidents in modern mining operations.**

By

Carlyle R. Burton

Oliver Iron Mining Company, United States Steel Corporation Subsidiary



A COMPREHENSIVE maintenance schedule for the component parts that go to make up a complete underground electrical system accomplishes two primary purposes. First, it minimizes accidents to employees due to electrical shock or the failure of electrical equipment and second, it cuts down loss in production due to electrical failure.

Although some mine supervisors have a tendency to minimize and to repair equipment only when breakdowns occur, it is much easier to arrange for planned delays rather than be forced to make the necessary arrangements after equipment has ceased to function. In discussing the proper maintenance of underground wiring, the proper installation of an underground power system should be briefly reviewed, since the proper selection and installation of an electrical system greatly affects the maintenance problem. One of the main problems in an installation is that of providing ample capacity. That is, to so design the system to handle the present mining load without excessive voltage drop and to allow for ease in adding additional capacity.

Starting with the main power transformers on the surface, it is suggested that periodic checks be made of the following: fence, gate, substation grounds, transformer temperature, transformer and substation insulators, switches, cables, cable end bells and connections. The substation grounds should be checked once a month visually, and the resistance value measured by means of a ground Megger once a year. It is our practice to maintain the

substation ground resistance value at not more than $1\frac{1}{2}$ ohms. Substation transformer temperatures should be checked once a month and at the same time a visual check of the substation and transformer insulators should be made. Once a year the insulators should be cleaned, using an insulator cleaner. Visual inspection of transformer temperatures may give a forewarning of mounting overload conditions and also give a check on the level of the transformer cooling medium. Dielectric strength of oil should be tested once a year. At the time of monthly substation inspection, a visual inspection should be made of connections, cables and cable end bells. Main power cables leading from the substation to the distribution panel should be tested for resistance once a year.

Maintenance Procedure

It is also vitally important to follow recommended maintenance procedures. Surface and underground distribution breakers should be inspected once a week to see that the operating temperatures of the breakers are not excessive, and once a year the circuit breaker blades and fingers should be checked and the oil tested. If the source of power for the underground tramming is located in the engine house, the level of the oil in the bearings should be checked daily, the condition of the brushes and of the oil should be checked weekly. The bearing oil should be changed whenever the sludge becomes excessive. Once a year the d-c motor generator set or rotary converter should be tested for resistance and the

set washed off with a solution made by mixing carbon tetrachloride with a trade cleaning solution. Good ventilation and air line respirators should be provided for the man doing the spraying. The hoist motors, hoist control, air compressor motors and auxiliary motor should be put on the same type of maintenance schedules as outlined for the underground locomotive power supply. The hoist control and slack cable indicator are inspected once a month and reset at the time the cage and skips are tested. All motors and generator frames, motor and generator switches, cases and control panels should be connected to a ground of not more than five ohms value.

When designing the original installation of an underground electrical system, sufficient disconnecting switches and sectional overload protection should be provided to facilitate the location of trouble in a small section. Sufficient disconnecting switches should be provided so that power may be removed from sections of the mine where no men are working. Switches should be so arranged that power can be cut off progressively as the men leave their working places.

Underground substations should receive the same attention with regard to installation and maintenance as surface substations except that transformers should either be air cooled or have a cooling medium which is non-flammable. If an a-c underground power system is used, a ground detector should be installed.

A maintenance program for underground pumps should also be included.

The installation of pumps should be in as clean and dry a place as possible, using the same or greater electrical clearances than used for surface installations. Pump motors should operate as nearly continuously as possible, since frequent starting and stopping causes unnecessarily high power peaks, results in faster deterioration of motor winding insulation due to heating and cooling, and necessitates greater maintenance of the pump starting control. Pump motors and their controls that are not used frequently should be inspected and the insulation resistance checked once a month, while those used regularly should be inspected once a week and insulation tested every three months. It should be emphasized that the pump motor and control must be carefully grounded by tying the pump, control, pipe line, set steel and track together as one ground system. It might also be mentioned that it is advisable to install the pump control in a safe area during sinking and development operations to keep it dry and protect it from blasting damage. While on the subject of pump controls, it is well to mention maintenance requirements for pump float switches. In general, a minimum of maintenance problems are encountered when switches are either float operated or are electronic type level control. In case a pump setup is operated unattended except for periodic inspections, it is advisable to install a second float to operate an alarm when the water reaches a point a few inches above the pump starting point of the pump control float switch. It is advisable to equip the float switch with a short piece of connecting cable that has been previously sealed between the float switch case and the cable and also to substitute a dry reconditioned float switch every month.

Motor Connections

The scraper or tugger motor electrical connections should receive special attention from the underground electrical organization because these are contacted by miners daily. Consideration should again begin with installation, because this is frequently a daily problem in large mines. A fused switch or magnetic starter with overload protection should be provided at the tugger so power may be removed by the tugger operator in case of an emergency. This switch also permits the operator, as required, to disconnect the power whenever he leaves the tugger. All the tugger switches, as well

as the tugger, must be grounded. By grounding, in addition to the usual connection of the ground lead in the cable to the switch and tugger, a separate ground wire should be run from the switch or tugger to the air line or track, preferably both.

Lighting

General drift lighting is usually provided by installing lighting unit stands at various intervals, consisting of a 2 kw. 440-220/110 volt transformer and a fused 600 volt switch supported by a light pipe frame work. Drift lights are usually placed 50 to 100 feet apart, located near the center of the drift to provide general illumination. Every hundred feet, a safety zone is provided into which employees may step when trains or locomotives approach. These areas may be marked with a blue light, offset slightly from the row of general drift lights. The general drift lights are usually installed using rubber insulated open wire supported on porcelain nail-held knobs. Conduit must be used in dry locations such as pump rooms, transformer rooms, fuse houses, and similar locations, but if moisture is expected, it is better practice to install lighting runs having rubber covered cable, and to provide metal junction boxes with rubber bushings and insulated supports.

Trolley wires should be mounted on trolley wire supporting insulators to eliminate contact with the wood caps. Guard boards should be installed on the side of the trolley wire near areas where men who are working with hand tools might come in contact with the wire. It is recommended that disconnecting switches be installed at loading chutes so trolley power may be removed at the section directly in front of the chute. Sectionalizing switches with overload protection should be installed at various locations in the mine to facilitate the isolation and location of trouble. The haulage track must be bonded across the rail joints, between rails, and between the rails and air or water line. There are a number of ways in which this bonding may be accomplished. The first and most common method is by welding copper bonds either on the side of the ball or the rail across the joint, or by welding a copper bond on the base of the rail beyond the angle bars. The second method is to drill or punch a hole in the web of the rail beyond the angle bars with a power velocity tool and drive in a copper wedge bond. A third method is to

weld the ends of the rails together with either electricity or acetylene. The latter method has been very successful for main line haulage if welded joints are annealed after welding.

The haulage locomotive presents another maintenance problem requiring a definite maintenance schedule. A master list should be given the mine electrician indicating the points to be inspected or lubricated. A check off list for each locomotive should be prepared, with the various points to be inspected or lubricated listed, and a space provided to record the date this was accomplished.

Planned Program

A well planned maintenance program should require the marking of all switches with tags indicating what equipment they control and what size fuse is required. Some mines provide, in a central location, filled, properly marked, cartridge fuses that may be installed by the shift bosses in the event of trouble and the mine electrician is not available. Where cables of different voltages are used in the same mine, the junction boxes, controls, and motors should be plainly marked. It is found good practice to maintain a one-wire diagram of the mine electrical system showing switches and fuse sizes, and, once every three months, go through the entire mine, checking fuse sizes against the print. Sufficient guards should be provided to prevent persons from contacting live electrical equipment or moving mechanical parts and a periodic check should be made to see that these guards are in place. Proper electrical fire extinguishers should be installed in the underground substations, pump rooms, and motor barn, and key men instructed as to their proper use.

In order to maintain a good electrical maintenance program, all persons concerned must be instructed as to its importance. This includes not only the mine electricians, but also the captains, foremen, shift bosses, and all other employees working underground. This may require a continuous educational program, explaining the general plan and the necessity for enforcing various rules. But, if a sound maintenance plan is carried out, it will eliminate those unnecessary accidents which are attributed to electrical shock or equipment failure, and it will minimize unnecessary delays in production schedule caused by equipment failure or electrically caused fire.

Selling **PLANNED LIGHTING**



LIGHTING SALES

Lighting is one of the greatest markets of the times. In volume and rate of growth it ranks high in national importance. In the electrical industry it is not only a great market for lighting equipment and lamps, but is absorbing a growing proportion of pipe, wire, labor hours, kilowatts.

An advancing lighting technology has, in fact, rendered obsolete many traditional concepts of the lighting job. The wiring system designed for so many watts per square foot terminating primly in well ordered rows of outlet boxes, the eventual selection of fixtures and their installation and the almost accidental lighting result belong to the days when the public was willing to adapt itself to any reasonable compromise with the dark.

Today we establish the light we want in intensity, quality, color and contrast, develop the required distribution, select the equipment and install it with an appropriate wiring system. The result is planned lighting.

In the rapid development of lighting technology and equipment, however, there is still no clear sales policy at the customer level. The "dealer" organizations of the lighting industry are well established electrical contracting firms in every city. The distribution of lighting fixtures and components is well established through agents and wholesale channels. Competent engineering service is widely avail-

able through consultants and utility lighting sales departments. Yet the total sales effort of the industry is far short of the kind of activity needed to reach even a small segment of the present potential market.

A very large factor in this reluctant approach to one of the greatest markets in the electrical industry is the lack of coordination among the many special interests of the electrical industry. The electrical contractors, electrical wholesalers, electric utilities and manufacturers are all interested in lighting sales and each has a major stake in lighting progress. At the customer's level, however, their efforts are often conflicting and ineffectual. Lack of clear policy and mutual confidence is too often apparent to the customer. The result is a sharp scaling down of market potential, a waste of already scant sales effort and personnel, and loss of business to all.

There are many points of view current as to leadership responsibility, sales tactics and the role of each branch of the industry. We hold here to a straightforward dealer policy using the existing flow lines of the electrical industry. If such a policy is not adopted now, it will eventually have to be created. There is no other practical way to bring the full coordinated effort of the industry to bear on its greatest sales opportunity.

LIGHTING INDUSTRY SALES

(1948 Estimated Dollar Volume)*

Lighting equipment, all types**.....	\$500,000,000
Light sources (lamps).....	350,000,000
Electrical energy.....	1,200,000,000
Total Industry.....	\$2,050,000,000

* R. W. Staud, President, Illuminating Engineering Society.

** Includes portable lamps of all types and all accessories, such as ballasts, reflectors, wireways, glass, wood plastics, wiring devices, etc.

NEW CONSTRUCTION MARKET*

Requiring New Lighting Equipment

(Thousands of Dollars)

Type Construction	Estimated Cost
Public Buildings.....	\$8,423,922
Industrial Buildings.....	3,543,714
Commercial Buildings.....	4,644,561
Unclassified Public and Private.....	7,806,966

* Backlog of proposed engineering construction as reported to Engineering News Record through December 1947.

RELIGHTING MARKET

Kind of Business	Approximate Number
Retail establishments.....	1,775,000
Service establishments.....	650,000
Other commercial establishments.....	1,850,000
Manufacturing establishments.....	190,000
Total number of establishments.....	4,465,000

The LIGHTING MARKET

THE potential market for lighting equipment, light sources, and electrical energy for lighting is astronomical. The most conservative estimates run into the billions of dollars. Pertinent data relating to the market for new lighting equipment, for both new construction and relighting are given in the Tables shown on these two pages. This huge market is available, now, to all electrical contractors, large or small, who are equipped and ready to go after it.

Early in the year it was estimated that the 1948 volume of sales on lighting equipment would total \$500 million. Based on the *Electrical Construction and Maintenance* forecast (January 1948, page 53) of a \$1.6 billion dollar electrical construction and installation market, it is indicated that lighting will equal approximately 31 percent of the total electrical construction dollar volume. It is also generally conceded that this lighting volume now exists without aggressive and coordinated sales effort by the electrical contracting industry as a whole.

The potential market for lighting equipment is divided into two major fields. One is the new construction market, the lighting of new factories, offices, stores and homes which are built annually. The other is the relighting market, involving the modernization of lighting in over four million manufacturing, retail, service and other commercial establishments, and some 25 to 30 million homes.

The size of the lighting market is not fixed. Annual sales of lighting equipment are determined by the sales effort expended. Annual sales can be limited to the volume

dictated by minimum lighting requirements only or, sales can be expanded to the volume required to provide modern day high intensity lighting tailored to the needs of the purchaser, on both new construction and relighting projects. The potential of the relighting market alone will challenge the efforts of the entire lighting industry for years to come.

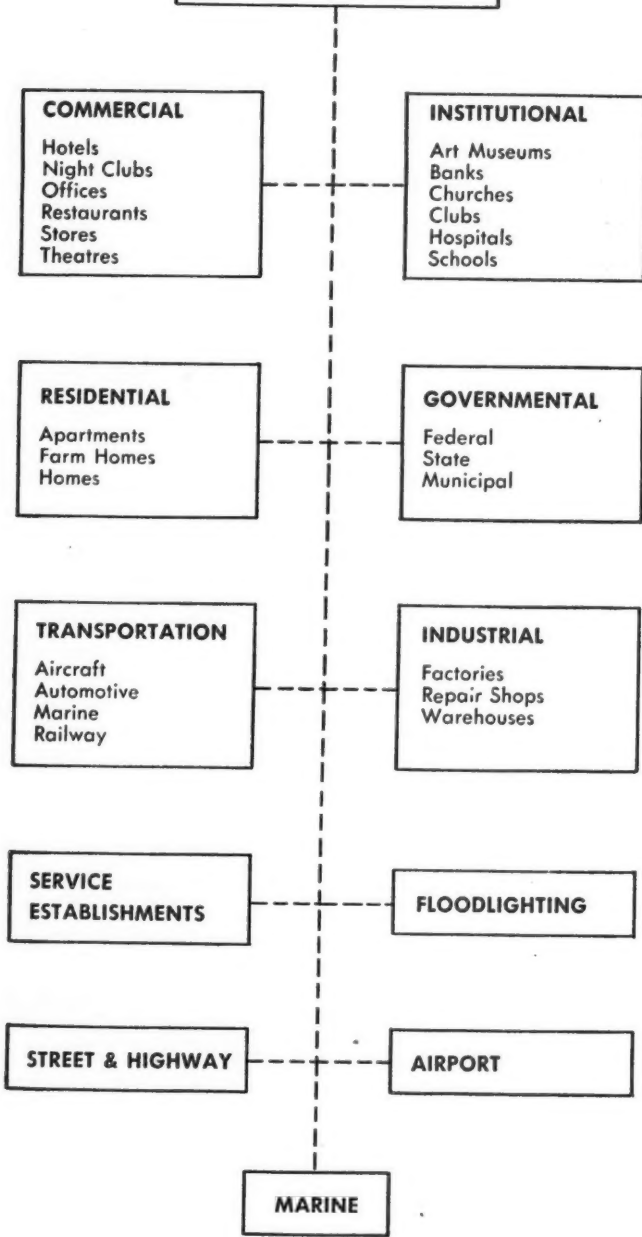
Progress in the development of new light sources and new lighting techniques creates a still larger market for relighting year in and year out. New standards of lighting are also set each year. Each outstanding new lighting installation aids in making all other jobs obsolete. This factor of obsolescence thus helps create a complete new relighting market on an approximate ten year cycle.

With a stepped-up sales activity, such as is possible with electrical contractors taking the initiative in the industry-wide *Planned Lighting* program, annual lighting equipment sales can easily be doubled or trebled. At the same time, the electrical contractors will be rendering a worthwhile service to their customers. It is estimated that at least 85 percent of the nation's square foot area needing artificial lighting is now obsolete. Relighting of this area to *Planned Lighting* specifications will provide all the well known benefits of better light and better sight.

A study of the table showing "Lighting Equipment Unit Costs" will help to show the size of the potential lighting market in any community. When these unit costs are compared with the unit costs of lighting installations being made, it will also indicate to some extent how well the

NEW LIGHTING MARKET

New Construction
and Relighting



LIGHTING EQUIPMENT UNIT COSTS

Type Occupancy	Range of Costs per Sq. Ft. From To	
INDUSTRIAL		
Rough work and storage areas.	\$.03*	\$.29
Average production areas. . . . .	.07*	.35
Fine work areas. . . . .	.10*	.55
Difficult seeing task areas. . . . .	.31	.78
High bay areas. . . . .	.06*	.09*
STORE		
Department stores.	\$.72	\$.93
General stores. . . . .	.45	.89
Specialty stores. . . . .	.36*	1.12
Show windows. . . . .	.66	2.04
OFFICE		
Drafting rooms.	\$.21*	\$1.49
Private offices. . . . .	.25*	1.57
General offices. . . . .	.15*	1.27
SCHOOL		
Class and study rooms.	\$.19*	\$1.38
Auditoriums. . . . .	.16*	.60
Gymnasiums. . . . .	.10*	.28*
Corridors. . . . .	.16*	.60
HOSPITAL		
Operating rooms, major.	\$3.08	\$4.23
Operating rooms, minor.	1.68	2.32
Private rooms. . . . .	.24*	.59
Wards. . . . .	.21*	.52
Laboratories. . . . .	.25*	.66
Corridors. . . . .	.19*	.65
CHURCH		
Auditoriums.	\$.50	\$1.25
Sunday school rooms. . . . .	.34	.51
THEATRE		
Auditoriums.	\$.25*	\$1.38
Lobbies. . . . .	.47	1.03
Stages.	1.25	3.00
RESIDENTIAL		
Low cost homes (Up to \$12,000).	\$.15	\$.34
Medium cost homes (\$12,000- \$25,000). . . . .	.17	.37
High cost homes (\$25,000 and up). . . . .	.23	.44

* Based on Incandescent Equipment.
The "unit costs" shown above represent the user's average costs, based on standard types of lighting equipment and on standard lighting layouts designed to provide lighting results considered appropriate and good practice for each type of occupancy. These "unit costs" will be higher when special lighting equipment, or above average lighting layouts, are used.

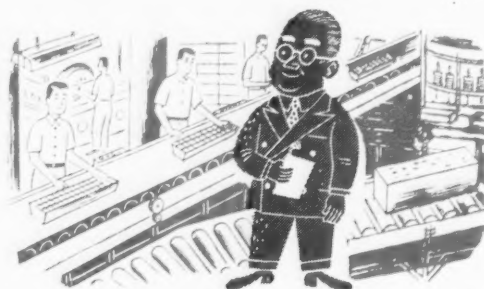
lighting has been planned. The cost data shown are consumer's costs, covering the lighting equipment only, and does not include installation costs, or any cost of wiring for lighting. The installation and wiring costs are the normal "plus" business which accrues to the electrical contractor when he sells a new lighting installation, either relighting or new construction.

To obtain these "unit costs", a number of manufacturers of lighting equipment were asked to supply "unit costs" on their own equipment for the various types of occupancies, using in one case their inexpensive equipment, and in the other case, their better line of equipment. It was stipulated that the lighting result in each case be appropriate for the seeing tasks involved in each type of occupancy, based on

today's modern lighting standards. The results from the various manufacturers were "averaged" to obtain the data shown. It was recognized that there are many variables in lighting equipment costs, and all manufacturers who submitted data pointed out that "unit costs" can be much higher, or, in some cases lower, than those "unit costs" which they reported. The data shown is therefore "average", and should be so considered.

Tabulation of unit costs on lighting equipment, installation, wiring, etc. should be made by electrical contractors on each lighting installation sold. Such data will be invaluable to the lighting salesman when talking to new prospects, as well as to the estimator as a check when figuring new jobs.

Selling PLANNED LIGHTING



PRODUCERS

1. Lighting Equipment Manufacturers

Luminaires
Reflectors
Portable lamps
Wiring channels
Metal housings
Spinnings and Castings
Refractors

2. Lighting Equipment Accessories Manufacturers

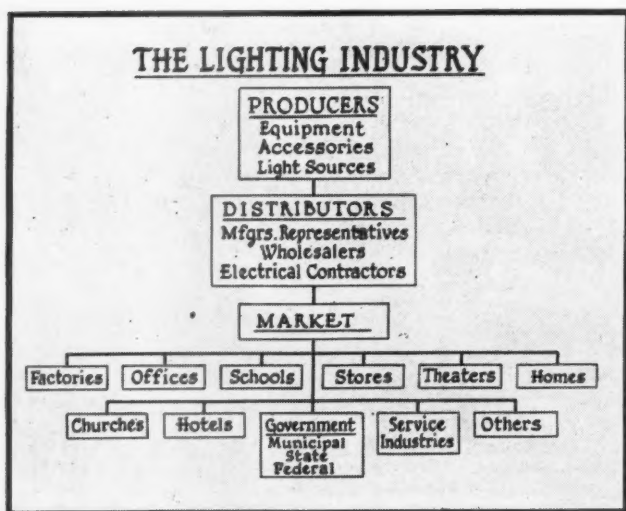
Transformers
Ballasts
Fluorescent starters
Fluorescent cathodes
Lampholders
Sockets
Louvers, Glass, Plastics

3. Light Source Manufacturers

Fluorescent lamps and tubes
Incandescent lamps
Mercury vapor lamps
Miscellaneous lamps

4. Electric Utilities

Electrical energy



AN ANALYSIS of the Lighting Industry, and of the segments which constitute this industry, will be helpful in an appraisal of the job to be done by each in selling the huge existing potential market for lighting.

Classified broadly, producers, distributors and specifiers constitute the Lighting Industry. Unlike most other industries, many of the groups in the industry divide their energies into other fields for a livelihood. Most lighting equipment accessories, for example, are produced by manufacturers whose major production is in other fields. Lighting equipment is usually only one of many products sold by distributors. Specifiers of lighting equipment, such as architects and consulting engineers, devote only a minor part of their time to lighting. This diversity of interests by the people who comprise the lighting industry may account in large measure for the lack of concerted industry backing of some of the industry-wide promotion programs, such as the Planned Lighting Program.

The LIGHTING

The *Producers* of the lighting industry comprise four major groups: lighting equipment manufacturers, lighting accessories manufacturers, light source manufacturers, and electric utilities (electrical energy for lighting).

Lighting equipment manufacturers produce and sell the finished lighting products. In general, their production is limited to a small amount of metal fabrication, with many of the component parts being purchased from the accessories manufacturers and assembled into the finished product. This is especially true with fluorescent equipment.

The accessories manufacturers sell the major part of their production to the lighting equipment manufacturers, and a small percentage direct to distributors for maintenance and repair.

Light source manufacturers are in a highly specialized production field. Continued research and new product development is required in this field, to constantly insure an ever increasing reliable product, high in efficiency, standard in color quality of light output, and with greater lamp life. The major market for light source producers is for replacement purposes, with a small percentage of production going to producers of lighting equipment.

The amount of energy consumed by light sources in lighting equipment accounts for a greater revenue to the utilities annually than the total dollar volume of all new lighting equipment and lamps sold annually, which accounts for the listing of electric utilities as a "producer" in the Lighting Industry.

Anyone who sells lighting equipment, lamps, and accessories is in a broad sense a distributor of lighting products. Distribution is concentrated through electrical wholesalers,



DISTRIBUTORS

1. Manufacturers' Representatives and Agents
2. Electrical Wholesalers
3. Electrical Contractors
4. Lamp and Lighting Fixture Retailers



EQUIPMENT SPECIFIERS

1. Architects and Designers
2. Consulting Electrical Engineers
3. Lighting Consultants
4. Industrial Plant Engineers
5. Commercial Building Engineers
6. Governmental Agency Engineers

INDUSTRY

and broadened at the electrical contractor and retailer level. Almost without exception wholesalers distribute many other electrical items in addition to lamps and lighting equipment. Electrical contractors also have many other products and services to sell. All retailers of lamps and miscellaneous portable lamps and lighting units sell many other products as well. Thus, there are few specialists in the wholesale or retail lighting business, devoted exclusively to the sale of lamps and lighting products.

In order to promote greater use and better application of lighting products, the producers and distributors of lighting equipment have found it necessary to provide engineering and layout services gratis to specifiers and to ultimate consumers alike. Engineering service on a fee basis is also available from the professional groups in the form of specifications.

The electrical contractor is in an enviable position with respect to engineering service on lighting to ultimate consumers. Staffed with a competent electrical engineer with specialized training in modern *Planned Lighting*, the electrical contractor may select and recommend any type lighting equipment required for the best solution of his customer's lighting problem. He is also able to include wiring and installation specifications in his recommendations, and quote on the entire work involved in connection with any proposed new lighting system. Thus, he is able to serve the best interests of his clients on a strictly professional basis. Properly backed up by the producers and distributors, he is kept well informed on all new products, lighting techniques and application practices, which he passes on to the lighting customers with a minimum of effort.

THE LIGHTING INDUSTRY Engineering Services

PRODUCERS (Free Service)

Equipment manufacturers	To	Distributors Professional Consumers
Light source manufacturers (lamps)		
Electric utilities		

DISTRIBUTORS (Free Service)

Electrical Wholesalers	To	Contractors Consumers Consumers
Electrical Contractors		

PROFESSIONAL (Fee Basis)

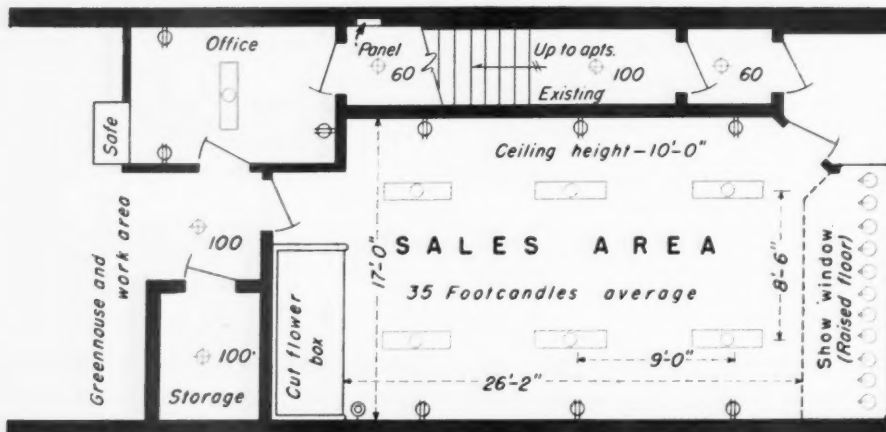
Architects, Designers	To	Consumers
Electrical Engineers		
Lighting Consultants		

Sales effort in the Lighting Industry today is primarily at the producer level. Manufacturers of lighting equipment, lamps, and accessories have assumed much of the responsibility for selling their products, all the way to the ultimate consumer level. With limited sales manpower, and inadequate postwar production due to lack of materials, the potential market for lighting sales has barely been tapped. Greater sales effort is required at the distributor level, and by the electrical utilities. A realignment of sales effort, based on the manpower available in each industry group and the profit returns is needed. Industry groups operating at the retail level must assume a greater sales promotion responsibility before the lighting industry can hit its stride.

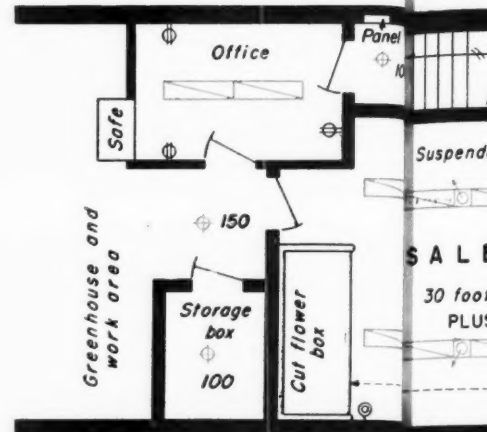
More lighting education is also needed. Manufacturers' salesmen, wholesalers' lighting specialists and salesmen, electrical contractors' salesmen, and illuminating engineers with electric utilities must all be trained constantly in lighting benefits and modern lighting application techniques.

Selling PLANNED LIGHTING

Layout No. 1



Layout No. 2



FLORIST SHOP LIGHTING LAYOUT...

...IS IMPROVED WHEN

LEGEND

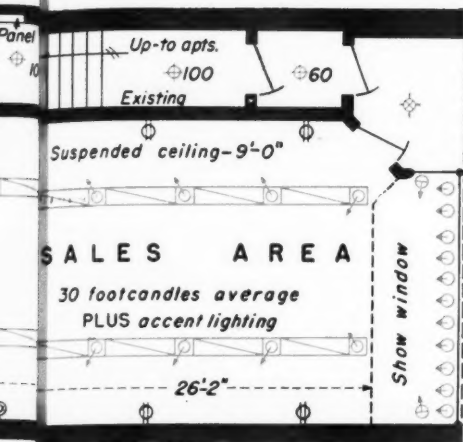
- 2/40 watt fluorescent unit, semi-recessed
- 150/300 watt R-40 spot lamp in housing, adj.
- 150/300 watt bullet spot reflector adj.
- 200 watt recessed unit with glass roundel

- Incandescent units-wattages indicated
- Wall outlet for refrigerator
- 150 watt recessed window reflector
- Double convenience outlet
- 4/40 watt fluorescent ceiling fixture

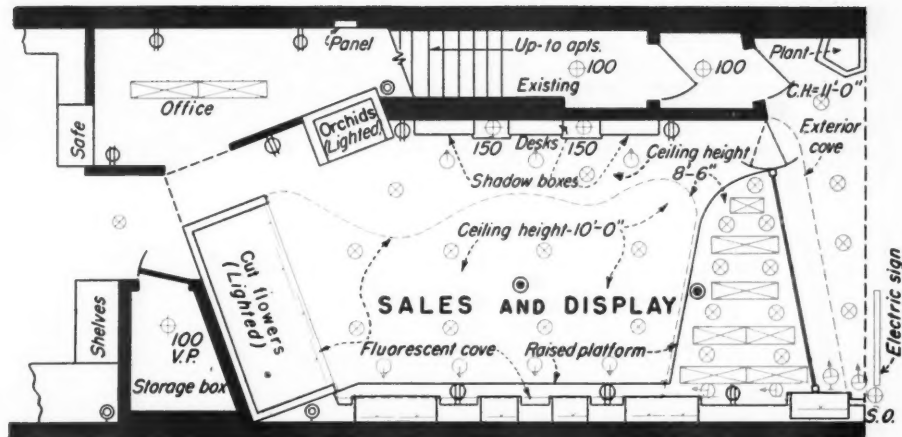
- 4-lamp recessed fl. unit, glass panel in bottom
- Fluorescent strip light - length as required
- 300 watt R-40 recessed and louvered
- 250 watt eyeball lens spot, recessed



HOW FLORIST SHOP LOOKS WITH LAYOUT No. 3 INSTALLED



Layout No. 3



WHEN PLANNED...

...AND FURTHER IMPROVED WITH MORE PLANNING

PLANNED LIGHTING

THE CONCEPT of *Planned Lighting* is not new. Mention this term to any old-timer in the lighting industry and he'll say "Sure, we've been selling *Planned Lighting* for many, many years". *Designed Lighting*, *Engineered Lighting*, *Lighting Specifics*, *Eye Comfort Lighting*, *Illumineering*, and many other similar terms have been used in the past by various lamp and equipment manufacturers, utility lighting departments and others to describe that type of lighting now generally referred to as *Planned Lighting*.

Planned Lighting, as it is used today, has a broader meaning than any of the older terms. It has been adopted by the entire lighting industry, not by an individual manufacturer or by a single segment of the industry. It has now been applied to an industry-wide program designed to promote better lighting in every lighting installation. This program has been developed and promoted by the Edison Electric Institute, and has been officially approved by all the other major segments of the entire lighting industry.

Planned Lighting offers the industry many specific advantages. As a program, it offers a solid front for the entire industry in selling the huge new and relighting markets. The term has a unique promotional value with buyers of lighting equipment and new lighting systems—the ultimate consumers of lighting products. With all parts of the lighting industry stressing the advantages of *Planned Lighting*, consumers are made conscious of the importance of light and lighting systems, lighting techniques, and the various types of lighting equipment. Consumers thereby begin to realize what light can do for them—in the home, at the office and in the factory, or on the streets and highways. Continual plugging of the *Planned Lighting* concept will eventually make everyone "light conscious", and result in a greater appreciation of the psychological, physiological, social and economic aspects of light and lighting. Lighting customers will develop a greater appreciation of the dramatic and esthetic value of light in the theatre, night club and restaurant, of the utilitarian value of light in the factory,

home, office, school and store, and of the value of light for recreation in sports and play-ground activities.

From an engineering viewpoint, *Planned Lighting* now offers each segment of the entire lighting industry a unique opportunity to use its full knowledge of the Science of Seeing, its knowledge of the many types of equipment, lighting systems and lighting techniques, to provide the right light for each seeing task. It offers the opportunity to sell lighting for comfortable seeing, of the right quantity and the right quality. It offers an opportunity to place emphasis on and sell *lighting results*, which is what the lighting customer is interested in buying. By selling *lighting results*, such as glare-free high-intensity illumination in offices, drafting rooms and schools, or a gay, cheerful mood from decorative treatments, the sale of lighting products automatically follows. Why not sell the customer what he wants—*lighting results*—rather than those things which have no appeal to him as such; that is, the lighting devices used to create the lighting results? For the industry to do less is to fail in its professional obligation to the customers.

The three lighting layouts shown on these two pages well illustrate *Planned Lighting*, what it is technically, and its advantages to all groups in the lighting industry as well as to the lighting customer. Layout No. 1, which involves a minimum of lighting equipment and wiring, is typical of many lighting systems being installed today without benefit of *planning*. The same layout would have been used 30 or even 40 years ago, except that incandescent units would have been used in place of the fluorescent units indicated. In *Planned Lighting* layout No. 2, light has been used to accent the merchandise as well as to provide high level general lighting. In layout No. 3, which was actually installed, full functional use of light was made, to attract customers, to display merchandise effectively, and to form a part of the decorative treatment. The lighting effect was truly *planned* to solve the seeing problems of the lighting customer. Its advantages over the other layouts are self-evident.

Selling PLANNED LIGHTING



LIGHTING SALESMAN presents *Planned Lighting* layout to a prospective customer.

THE Planned Lighting Program has bogged down. But there is still hope for its success. The fundamental facts on which its concept were based still exist. The potential lighting market is bigger than ever. And potential customers are in a receptive mood for better lighting. The job ahead is less one of selling the customers than it is of selling the lighting industry itself.

The reasons for the Planned Lighting Program failing to go ahead as planned and hoped for are relatively unimportant. Even though the Program was conceived, spearheaded and has been promoted by The Edison Electric Institute, only a few of the electrical utilities have wholeheartedly adopted it. Lack of kw. capacity and trained lighting personnel are the reasons most generally given. Materials shortages and lack of adequate production to meet current demands have retarded active participation by manufacturers of light sources, lighting equipment and lighting accessories. An increase in the total volume of electrical construction work has taxed the manpower and facilities of the electrical contracting industry. The problem here has been one of keeping pace with the work available. Salesmanship has not been necessary.

But now the situation begins to change. Most postwar industrial expansion has been accomplished. High building costs have retarded new construction work in many other fields. Light sources and lighting equipment are now being produced at a greater rate, so that production begins to exceed demand. Electrical contractors are completing many of the large projects which have kept them busy

postwar to the present. Once again the technique of selling, of creating new markets, must be adopted.

The selling of *Planned Lighting* opens up a new, and practically untapped market for the electrical contracting industry. The road has been paved. Through the efforts of lamp manufacturers, lighting equipment and components manufacturers, and electrical utilities, new standards of lighting have been established. Higher intensities were justified and sold to industry during the war years. New developments in light sources, lighting equipment and lighting application techniques have been introduced postwar. Many outstandingly good lighting installations have already been sold. These superior lighting jobs have set new lighting standards, and made obsolete practically all previously installed lighting jobs. There is a big job ahead in selling modern *Planned Lighting* on all new construction, but the major lighting market is in relighting.

All other groups in the lighting industry are sincere in their desire for the electrical contracting industry to spearhead retail lighting sales activity. They sincerely believe the contractor is the man to do the job. They are prepared and eager to help him in every way possible. Promotion plans, technical assistance and personal sales aid by trained lighting specialists are all available, now, to any electrical contractor anywhere in the nation who requests them. All these sales helps are embodied in the Planned Lighting Program, and are available from lamp and lighting equipment manufacturers, electrical wholesalers and electrical utilities. Lighting education is also



TRUNK OF SALESMAN'S CAR is equipped with special plywood case for filing catalogs, photograph album, and other selling aids.



SALESMAN SHOWS CUSTOMER other *Planned Lighting* installations with standard 2x2 slides and Viewlex projector at customer's own desk.

The Electrical Contractor . . .

Organized for Planned Lighting SALES

being sponsored by a large number of the Sections and Chapters of the Illuminating Engineering Society. The lighting industry has backed this promotional and educational activity on lighting because it is determined that a better lighting job shall be done. If the logical man to do this better lighting job, the electrical contractor, does not seize this unprecedented opportunity and take the initiative in selling *Planned Lighting* soon, the industry is certain to take steps to accomplish the job ahead some other way.

How can the electrical contractor take the initiative in the Planned Lighting Program? What can he do to cash in on this once-in-a-lifetime opportunity? A relatively small number of electrical contractors are already doing an outstanding job in promoting and selling lighting. An analysis of how these contractors are organized, how they operate and what they do now and can do further will furnish some of the answers. Such analysis is given here and on the following pages.

The spearhead of any contractor's lighting activity is his sales force. Good lighting salesmen are an absolute necessity. These salesmen must know lighting. They must know lighting fundamentals, lighting economics, and lighting techniques. They must know light sources and lighting equipment, and the advantages and disadvantages of each type. To be successful, they must also know and practice all the rules of good salesmanship.

In the larger contractor organizations where the volume of work handled will warrant it, salesmen should devote their entire time to selling. In smaller organizations, espe-

cially those located in smaller communities, the salesman may also function as the lighting engineer, designing and planning his own jobs. One good lighting salesman should be able to handle all lighting sales for a contractor located in a community of 50,000 population or smaller.

The lighting salesman will need certain sales tools and equipment. He should have an automobile for transportation, and for taking with him on all calls some of the more important tools, such as light meter, voltmeter, brightness meter, rule and tape measure, photograph album, sales binders, lighting catalogs, sample lighting units, light sources, and similar tools of the trade.

Some of the sales aids which have proved useful to lighting salesmen and should be made available and used as often as possible are listed below.

Demonstration show room. The contractor should have a display room for demonstrating modern lighting techniques, types of equipment and lighting results, or make arrangements with the electrical utility or lighting equipment wholesaler to use their facilities for such lighting demonstrations. In communities where no such demonstration rooms are available, the salesman can make good use of a list of the better lighting jobs in the community. The owners of these good lighting jobs will usually be more than pleased to cooperate with the salesman by making their premises available for inspection by others in their community who are considering new and improved lighting systems.

Planned Lighting photograph album. Each *Planned*

Lighting job sold should be photographed. The salesman should bind these photographs in an album, and work up the pertinent data on each installation. He can then use this album with prospects to show different types of lighting systems, types of equipment, and lighting techniques.

Slide projector. Slide projectors have been developed which are specifically designed for use by salesmen. The small 35 mm. slide transparencies in either black-and-white or color are inexpensive. Actual lighting results can be illustrated much better with slides than with photographs. With a file of good lighting slides, the salesman can tell and demonstrate a convincing lighting story to the prospect in the prospect's own office.

Sales binder. The salesman should prepare his own sales binder. It should be a loose-leaf type binder, preferably using standard binding posts. The salesman should include in this binder any and all standard reference material which he finds through experience that he needs in order to do a good selling job. He will want to include in the binder catalog data on all lighting equipment, accessories, lamps and other products which he will recommend and sell. The standard jobber's catalog pages prepared and furnished by most manufacturers to their distributors will be found to be desirable for this purpose. Complete catalogs of individual manufacturers may also be used by the salesman, but will be found to be bulky and heavy in comparison with the standard jobber's catalog pages.

The salesman will also find need for special charts, tables and other reference material in his day-to-day selling. Such reference material can be assembled and filed in the sales binder under classified subjects as indexed, to facilitate easy reference. Information which is published regularly in trade magazines, or in manufacturers' catalogs, the IES Lighting Handbook and elsewhere can often be used to help sell a prospective customer. Such material can be photostated and filed for quick reference in the sales binder. Much of the material will also be prepared and worked up into charts by the salesman himself, to meet his own needs.

Demonstration equipment. Use of samples is frowned

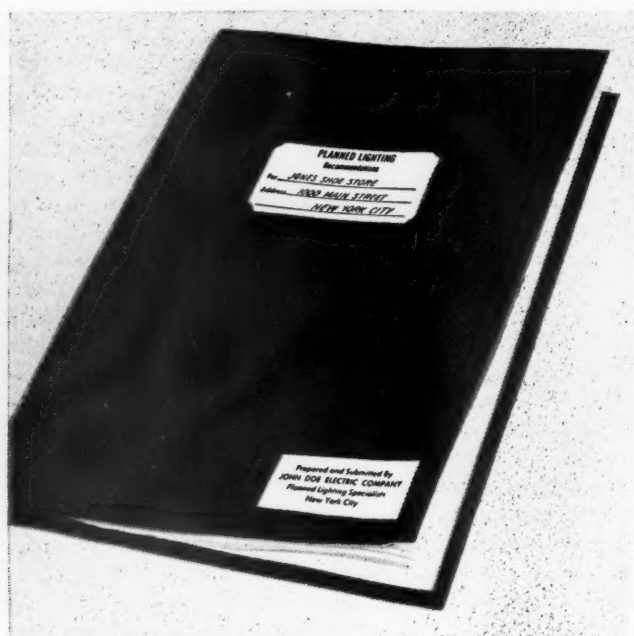
on by many salesmen. Samples are usually heavy and bulky, and difficult to handle. However, use of a limited number of samples may help sell many lighting jobs under certain conditions. When it is felt that a demonstration would help close an order, it should by all means be made. Demonstration equipment should be kept at a minimum, and used only when some other selling technique fails to clinch the order.

Lighting Literature. Promotional literature, envelope stuffers, etc., should be developed and used extensively by the salesman. Such literature should be individually prepared, featuring *Planned Lighting* installations which the salesman has sold locally, or featuring the services offered by the salesman's firm, such as *Planned Lighting* maintenance, free lighting design and layout service, adequate wiring, expert installation work, and other similar services featured. Reprints of published material about the salesman's firm will prove valuable in building confidence in the firm and creating additional good will. Some piece of lighting literature should be left with each prospect on each call made.

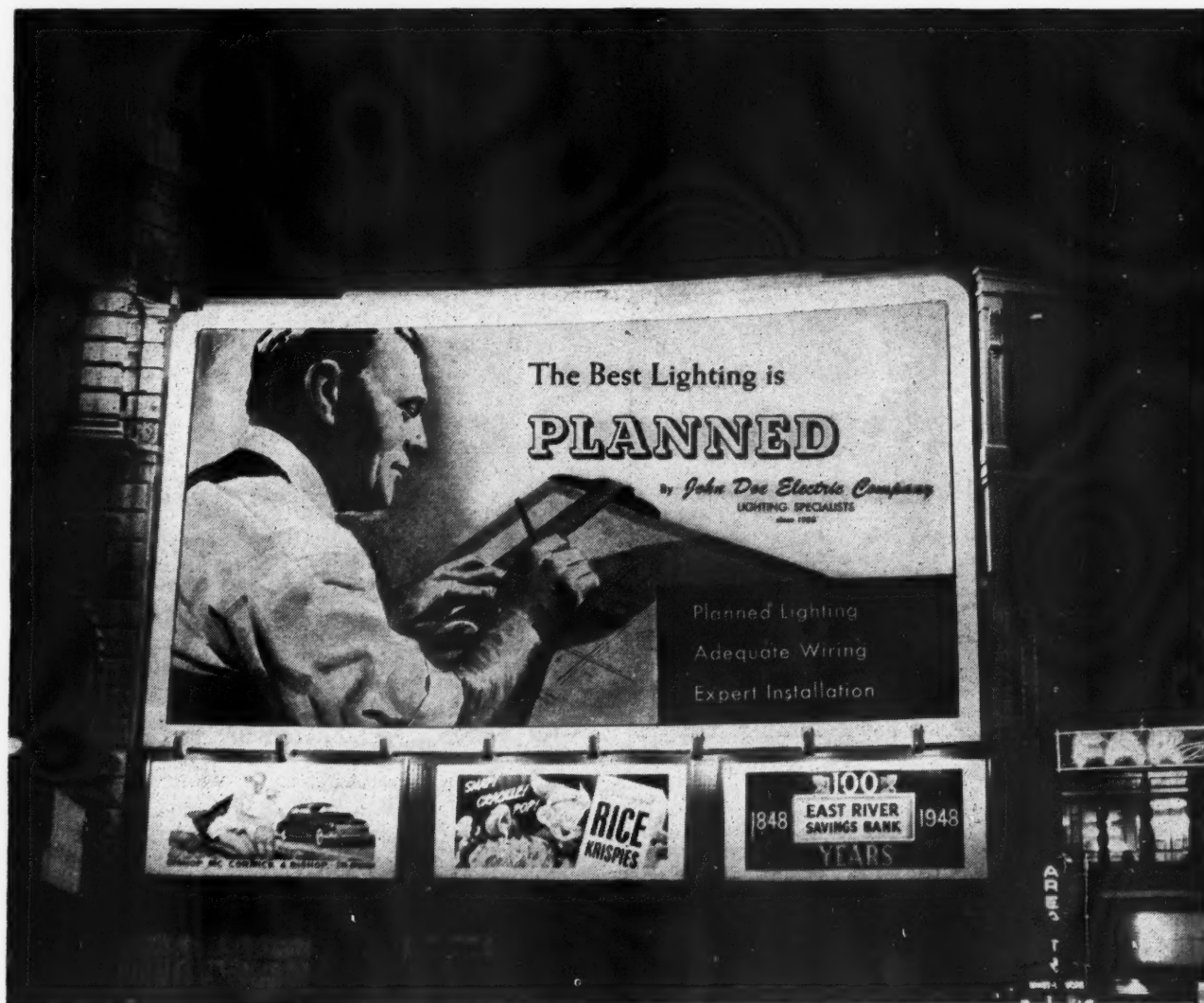
Direct Mail promotion. *Planned Lighting* can only be sold aggressively through personal calls. However, prospects can be developed very successfully through Direct Mail promotion. Such promotion should be developed specifically for a particular class of customer. For example, a special promotion can be developed around the specific lighting problems involved in lighting drug stores. The classified telephone directory will furnish a good list of prospects. A series of personalized letters can be prepared, and mailed about a week apart. A single page promotion piece featuring an outstanding job already sold using a good picture of the job, and stressing the quality of the work done by the contractor, services offered, etc., can be made up inexpensively. A return post-card asking for a lighting survey and recommendation should be enclosed with each letter. The salesman should make a personal call follow-up on each name on the promotion list. Electrical contractors will also find manufacturers of lighting equipment eager to tie in with such promotion activities.



AN ALBUM OF *Planned Lighting* installation photographs is an important salesman's aid.



PLANNED LIGHTING layouts are bound in attractive folders for presentation to the prospect.



OUTDOOR SIGNS help sell more *Planned Lighting*.

Advertising. The electrical contractor can back the lighting salesman effectively and profitably with a certain amount of advertising. This advertising can be any or all of several types. Outdoor signs can be used (see illustration) featuring *Planned Lighting* service. Special lighting ads can be used in the local newspaper and local trade publications. Spot radio announcements will prove effective in getting the contractor's name before the public. Direct mail promotion with all regular customers should be company-sponsored continuously.

Club and Association memberships. Salesmen should be encouraged by their firms to take an active part in local business, social and professional clubs and associations. The contacts made with other professional and business men will prove invaluable. Some of the groups with which the salesman should be affiliated include the electrical league, electrical contractor's association, Illuminating Engineering Society, the country club or fraternal organizations, the Kiwanis, Lions, or other similar groups.

The specialized lighting salesman holds a unique position. Each lighting job sold represents his professional work. These jobs can be seen. Lighting is dramatic. A good lighting installation is something tangible of which the salesman may well be proud. The salesman is capably backed at all times, so that he may obtain specialized assistance whenever it is needed. First, he is backed by his own

qualified organization—in good lighting design, qualified electrical construction and expert installation and maintenance. He is backed by the lighting department of the local electrical utility, which is ready and eager to help him sell better lighting jobs at all times. The local representatives of lamp manufacturers are prepared to give him expert advice on light sources for any lighting application. His supplier of lighting equipment, the electrical wholesaler, maintains a lighting specialist to give him technical or sales assistance wherever needed. And the local representative of the lighting equipment manufacturer whose products he is selling is a qualified lighting sales engineer, specially trained in the application of these lighting products, who is available for both technical and sales help.

Planned Lighting layouts. The salesman's job in selling *Planned Lighting* is to locate the prospects, obtain their permission to make a survey of the prospects' lighting problems, have a *plan* made showing the solution of these lighting problems, and then to sell the new lighting system according to the lighting *plan*. The *plan* and recommendations should be presented to the prospect in a neat folder, such as that illustrated on page 66. A quotation on the job should be submitted separately in a sealed envelope. The *Planned Lighting* layout and quotation should be delivered to the prospect by the salesman, by appointment, and the order closed at the time of presentation.



ENGINEER prepares Planned Lighting layout.

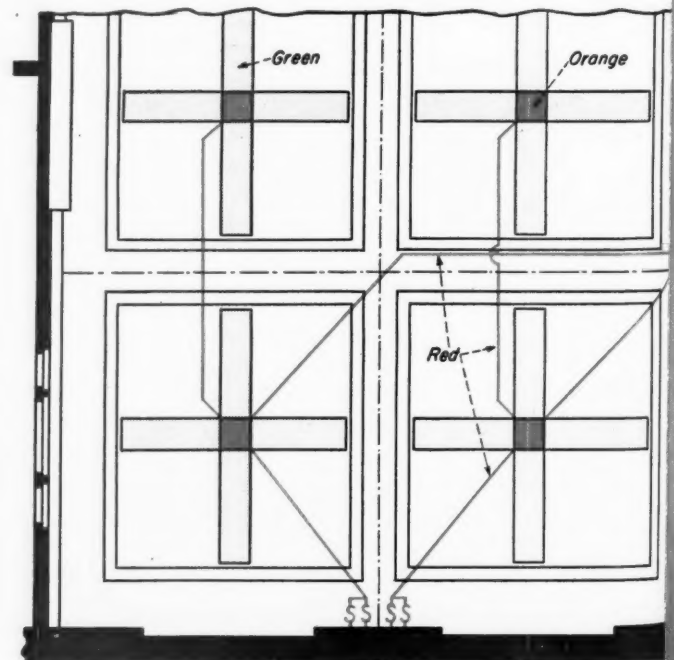
AS the lighting market becomes more highly competitive, lighting systems will be sold more and more on the basis of their sound engineering principles and their ingenious and practical design and layouts. Lighting plans which are based on new and appropriate lighting techniques for the solution of the customers' specific lighting problems will be the ones adopted. The function of the contractor's lighting engineer is to prepare such *Planned Lighting* layouts. Working closely with the lighting salesman and electrical construction foreman, he will prepare lighting designs and layouts involving sound application of new light sources and new lighting equipment which can be sold on merit rather than on price.

A good lighting engineer is a talented and versatile individual. He should be well trained in the fundamentals of illumination and electrical engineering. He should have some training in architectural principles, art and decoration. He must be a capable draftsman, expert in line drawings, and have some knowledge of perspective drawing. Of necessity, he must know the physical and technical details of all available light sources, and be well informed on all modern lighting techniques, lighting systems and lighting equipment.

The *Planned Lighting* engineer needs the usual facilities and instruments required to prepare lighting and wiring layouts. These include a drawing board, tracing table, set of good drawing instruments, triangles, T-square, parallel straight edge, slide rule, scales, rules and similar equipment. He should also have available a light meter, brightness meter, voltmeter and measuring tape, required for making surveys of old lighting installations, and in checking new lighting systems after they are installed. The lighting engineer is also the logical person to take "before" and "after" pictures to show the lighting effect, in which case he also needs a good ground-glass type camera, flash equipment,

The Electrical Contractor . . . Organized for Planned Lighting ENGINEERING

tripod, exposure meter and set of filters. The camera can often be used advantageously when making a survey of an old lighting installation to record construction and structural details of buildings, special machines, etc., to supplement field notes and measurements. It will also be found most useful in taking pictures of installation details, and of final lighting results. These pictures can be bound in photograph albums, one set of which will be found to be most useful by the salesman.



USE OF COLOR in layout



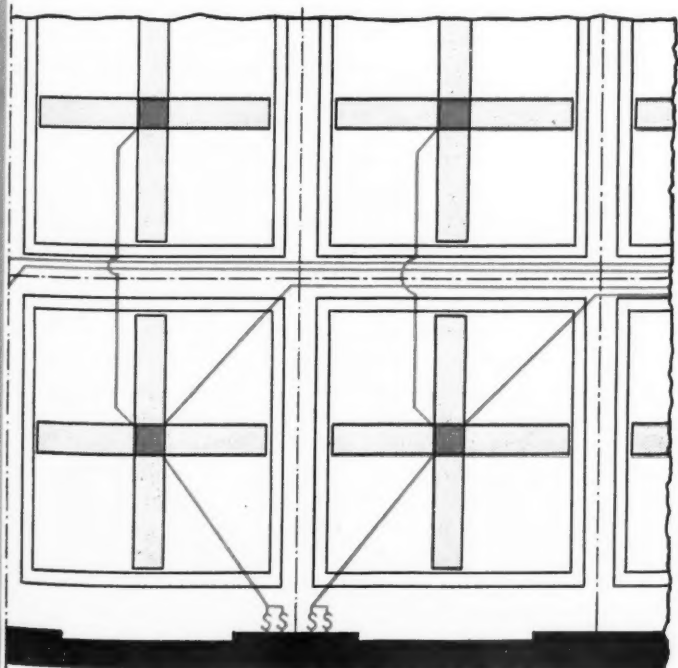
ENGINEER AND SALESMAN survey old job.

A complete set of catalogs showing various manufacturers' complete lines of lighting equipment, luminaires, lighting accessories and light sources should be available to the lighting engineer, estimator and purchasing agent. The lighting engineer will also require a complete file of lighting data and handbooks, distribution curves, specification sheets on typical luminaires, and cross-section scale drawings on recessed and built-in type equipment.

In preparing a lighting layout and recommendation all

finished drawings should be white prints. The building outline should be in black (or blue) lines. Plans should be drawn to a scale of "one-fourth inch equals one foot". Lighting equipment drawn in to scale in outline should also be in black (or blue) lines, and the interior of the lighting unit symbols colored with crayon or colored pencil (typical example shown below). Wiring details should be shown in color, using one color to indicate existing wiring which will be used, and a contrasting color to indicate new wiring to be added. Use of white prints and colored symbols for lighting equipment and wiring make it easy for the prospect to visualize and understand the lighting and wiring layout.

The lighting engineer should normally prepare the written lighting recommendation, although this may also be done by the salesman. Standard sales paragraphs can often be developed for specific subjects, such as store lighting, office lighting, or church lighting. Specially prepared copy can be used to supplement the standard paragraphs, in which the specific lighting system, lighting equipment, special wiring and other features may be described. A complete "Schedule of Lighting Equipment" and "Schedule of Lamps" should be included with each recommendation. Specification sheets should be made a part of each recommendation covering all standard type luminaires used. If special units, or standard lighting components and parts are recommended, these should be illustrated by specially prepared sketches drawn one-fourth full size. The entire *Planned Lighting* recommendation, including specification sheets, schedules of lighting equipment and lamps, and written copy and drawings should be bound in an attractive folder (page 66) and labelled with the customer's name and address on the outside. Quotation covering the recommended lighting should be made out separately, and both the recommendation and quotation should be delivered and presented to the prospect personally by the salesman.



accents lighting units and wiring.

The Electrical Contractor . . .

Organized for Planned Lighting ESTIMATING



ESTIMATOR FIGURES QUANTITIES and costs on wiring, lighting equipment and installation.

AN electrical contractor's success in business is dependent to considerable extent on the ability and efficiency of the personnel in the various departments of his organization. One of the departments which performs a detailed but important function is the estimating department.

The job of estimating *Planned Lighting* is little different than that of estimating normal electrical construction work. In fact, each lighting job usually involves considerable electrical construction and wiring. Very little additional knowledge is required to enable the estimator to become adept in estimating *Planned Lighting* layouts efficiently and accurately.

When the lighting engineer has completed a *Planned Lighting* layout, he passes it on to the estimating department. The estimator then makes a detailed "take-off" of all materials and equipment and estimates the amount of labor required to do all the work. From his work sheets he prepares a list of all materials and equipment which will be required by the job. This list is referred to the purchasing department for unit costs. The purchasing department lists unit costs on all items carried in stock direct from the stock

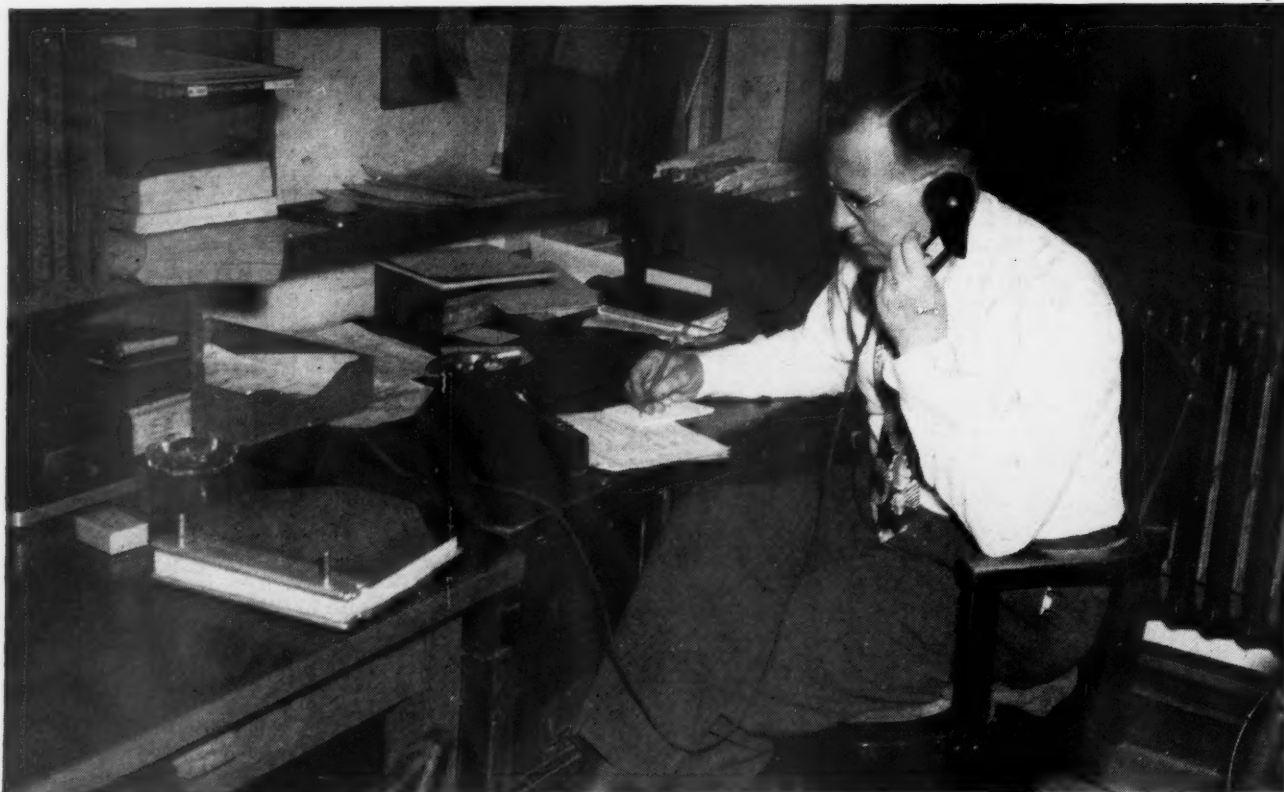
record cards, and the purchasing agent obtains quotations from various suppliers on all other items not stocked. These cost data are then returned to the estimator, where they are combined with labor costs to determine the contractor's total cost for doing the job. Salesman's commissions, insurance, overhead and profit are then added to determine the final selling price of the job. A quotation is then authorized based on the selling price thus established.

There are many things estimators can do to simplify their work and to improve the accuracy of their estimates. They should first of all discuss each job in detail with the salesman, lighting engineer and electrical foreman. Through such discussions all details not fully covered by the plans and in the recommendations can be clarified and settled. This will also insure agreement between the salesman, lighting engineer and electrical foreman before the job is actually sold. When new lighting techniques and new types of equipment are involved, thorough discussion will also enable the estimator to make a more accurate estimate of the labor involved, and of miscellaneous materials, tools, etc., required to do the work as planned. When estimating bid

DATA SHEET FOR PLANNED LIGHTING EQUIPMENT

TYPICAL ESTIMATING FORM used in figuring lighting equipment costs.

71



PURCHASING AGENT places all orders for materials.

The Electrical Contractor . . .

Organized for Planned Lighting PURCHASING

THE importance of the purchasing agent's function in the electrical contractor's organization should not be overlooked. Whether this function is handled by a full-time purchasing agent, or as part-time work by some other person in the smaller organizations, specific rules and operating procedures should be established. These rules and procedures should be designed to save time, to facilitate purchases, to provide adequate records for bookkeeping, to furnish readily available information on inventories and unit costs, to show turnover on stock items, and to save money through well planned purchase policy. Established electrical contracting organizations qualified to become *Planned Lighting* specialists already have such purchasing departments established. The addition of lighting equipment purchases can easily be handled by these organizations.

Each purchase order, regardless of size, should be placed with the supplier through the purchasing department. No order should be placed without a purchase order number, and each order should further be identified with either a job number or a department number. Such identification will simplify bookkeeping and cost accounting.

Planned Lighting contractors will find it both desirable and profitable to stock many standard items of lighting equipment. The size of the stock needed on individual

items will be governed to considerable extent by the lighting salesman's attachment to and sales effort on specific types of units. The salesman will in turn be influenced on the type units on which he puts major effort by the amount of sales cooperation which he receives from the suppliers and manufacturers. The salesman should be consulted on lighting units which he recommends be carried in stock.

Perpetual inventory files should be established for all items carried in stock. Depletion of stock on individual items to supply jobs sold can automatically be replaced by the purchasing agent as the stock diminishes.

An important function of the purchasing agent is the checking of prices on specific types of units of different manufacture for the salesman, engineer and estimator. This will insure the best equipment at the lowest price commensurate with quality being recommended on each job, and assure a fair margin of profit even when meeting competition. The purchasing agent should also obtain firm quotation on all items, both standard and special, for use by the estimator on each job figured. This relieves the estimator of this detail, and makes it possible for the purchasing agent to consider standard package purchases, and otherwise conform to all policies relating to purchases and buying practices which have been established by his firm.

The Electrical Contractor . . .

Organized for Planned Lighting INSTALLATION

ALL types of electrical construction work require specialized knowledge and technical know-how. This is particularly true in the installation of *Planned Lighting* systems.

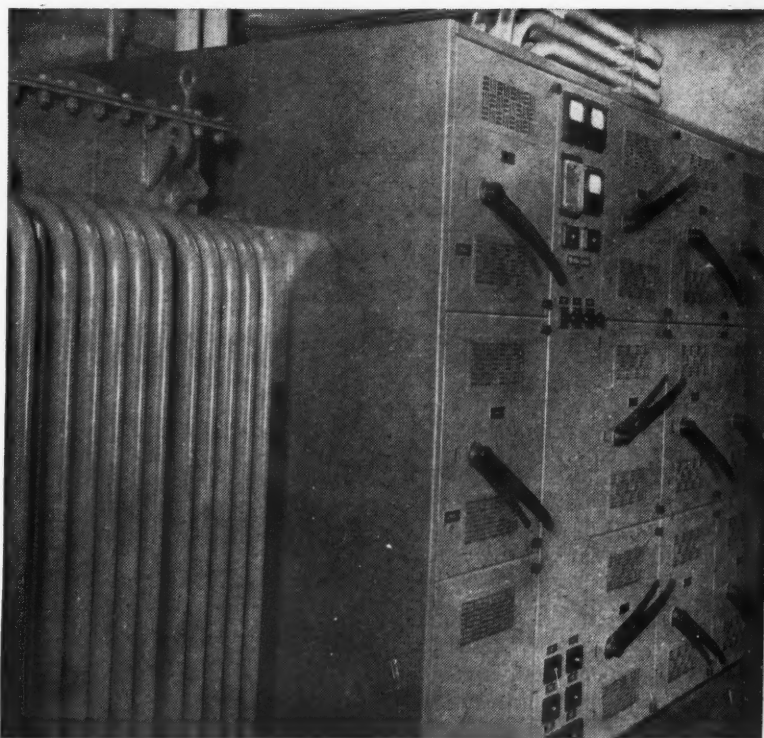
Planned Lighting installation work begins at the distribution transformer. The entire wiring system and all controls, from the distribution transformers to the lighting outlets, are a part of every *Planned Lighting* system. On large jobs, the lighting system usually is only a part of a major electrical system involving wiring for both light and power. The selection and installation of the lighting equipment and of the wiring and controls requires mechanical and structural knowledge as well as technical electrical knowledge. This is the electrical contractor's specialized field.

A carefully planned lighting system cannot be considered complete until the wiring system and controls have been studied in detail and made a part of the lighting plans. On new construction work the consulting electrical engineer usually incorporates the wiring layout and engineering with the lighting layout and specifies a complete lighting and wiring system. The electrical contractor then carries out the job as specified. But in the case of relighting, few projects are specified by a consulting electrical engineer. This job becomes the responsibility of the electrical contractor.

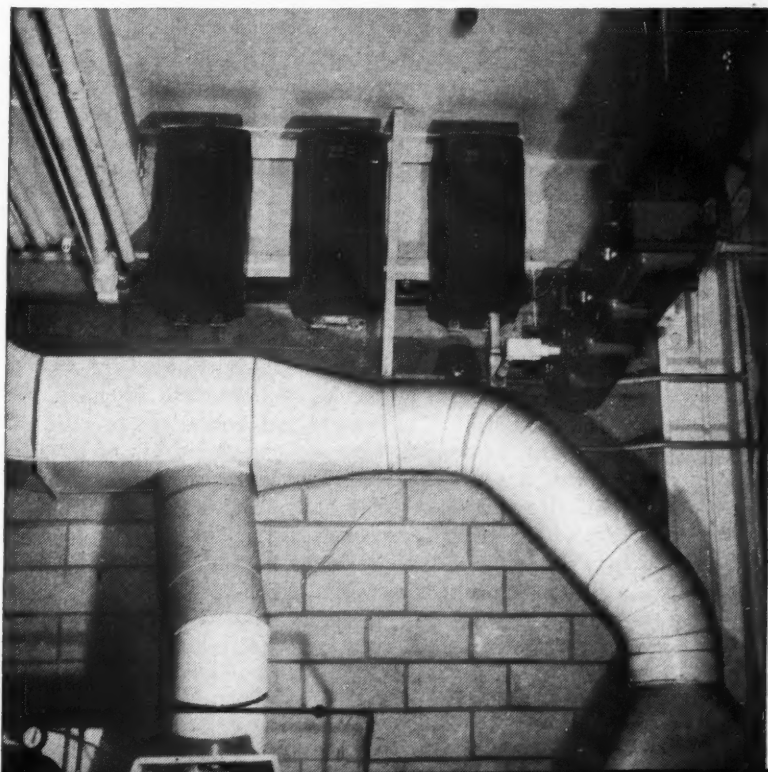
The wiring system for every *Planned Lighting* installation should be designed so that full rated voltage exists at the sockets for incandescent lamps, or at the ballast lead connections for fluorescent or mercury vapor lamps, when full load is applied. Any decrease in applied voltage, due to an improperly designed wiring system, results in a decrease in light output and change in color quality of the light on incandescent lamps. Poor voltage regulation will also result in unstable operation of fluorescent or mercury vapor lamps. Only when full voltage is supplied, with stable voltage regulation, can the owner get the full amount of light he pays for in energy consumed by the lighting system.

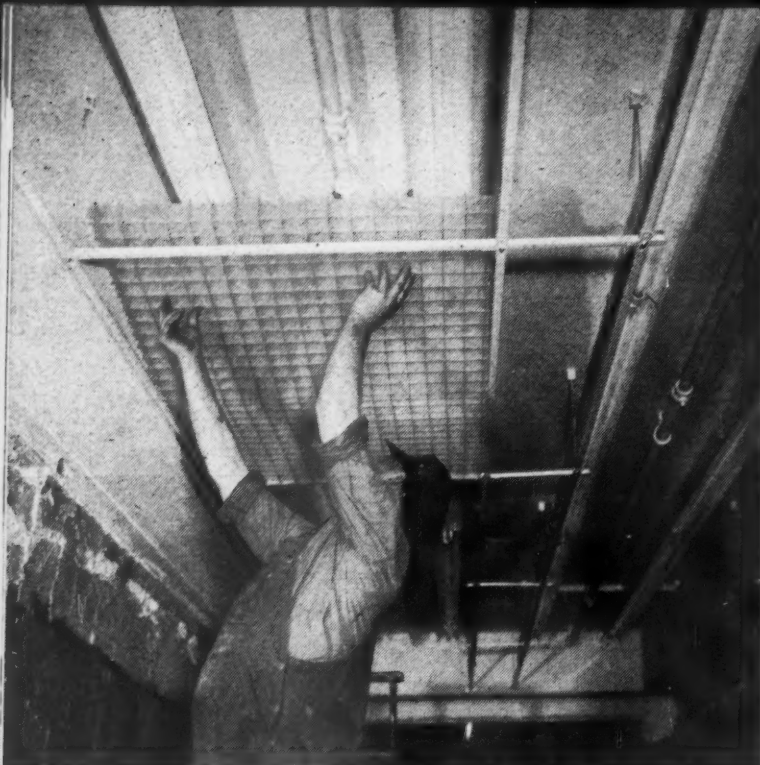
In order to insure the satisfactory operation of every new lighting system installed, electrical contractors carefully study the lighting plan and the lighting load to determine which type of electrical distribution system will most adequately meet the requirements of the lighting system and provide the most economical operation. Where fluorescent or mercury vapor lamps are used, analysis often indicates economies of operation with higher voltages, or with a change in the type of distribution system on relighting jobs where standard 120 volt single phase two- or three-wire systems already exist. On *Planned Lighting* layouts and recommendations prepared for prospective customers by the electrical contractor, or by a consulting electrical engineer, it may be assumed by the customer that such studies and analyses have been made and taken into consideration before making the final recommendation.

Modern *Planned Lighting* techniques involve many types



INSTALLATION of *Planned Lighting* systems starts at the distribution transformers. These vary from large capacity power and light units (above) to individual lighting transformers (below). Installation also includes all wiring, feeders, branch circuits, controls, etc., as well as all lighting equipment, louvers, luminous ceilings, and lamps.





LOUVERALL CEILINGS involve new installation problems for electrical contractors.



RECESSED TROFFER lighting systems may be installed in a number of different ways.

of lighting systems. Some of these are relatively new, such as louvered ceilings or recessed troffer systems. Specialists in electrical construction work and installation problems are well-equipped, however, to quickly analyze and solve the many installation problems which these new lighting techniques present.

Planned Lighting inherently indicates that specific types of lighting equipment are selected which will most effectively solve the specific lighting problems of each lighting prospect. This means that many types of lighting equipment will often be involved on the same job. It means that additional lighting controls may be needed to provide adequate switching facilities and flexibility of lighting results or lighting effects in the lighting system. It often involves the use of time switches to automatically control the turning on and off of show window and display lighting, of flood-lighting, or of fountain lighting. Or, it may mean the use of remote control switching, or of photoelectric control of lighting in class rooms, offices or drafting rooms. It also means that the electrical contractor and his lighting salesman, lighting engineers and installation mechanics must be fully informed on the application, installation and use of all types of lighting systems, lighting equipment, lighting controls and special wiring which may be required on any job.

The electrical contractor who specializes in the sale, design and layout of *Planned Lighting* systems must also be organized to install such systems. With the many types of systems and lighting equipment which are available for use, this means that he must be equipped with the right kind of tools of the many types which are required, as well as properly trained mechanics and electrical foremen. He must have trucks to transport these tools, plus materials and equipment, to the job. He must have ladders of all sizes to meet the varying conditions encountered on different jobs. He must be prepared to put up scaffolding on some jobs where ladders are not adequate. In addition, he must furnish mechanics with all types of special and power tools which will make the work easier or save time. The

mechanics are also each equipped with a complete set of hand tools. The installation of modern *Planned Lighting* systems involves more and more special equipment, and the contractor must have all the tools and facilities needed to work with wood, plaster, masonry, steel or concrete.

The electrical foreman and his mechanics must be trained to install lighting units and equipment varying from suspended or ceiling surface mounted individual units to complete ceilings of glass or louvers. Suspended and ceiling surface mounted units may be individual units, or may be of the continuous row type. Continuous row units must be carefully aligned so that the rows are straight, and the individual units must be installed in line.

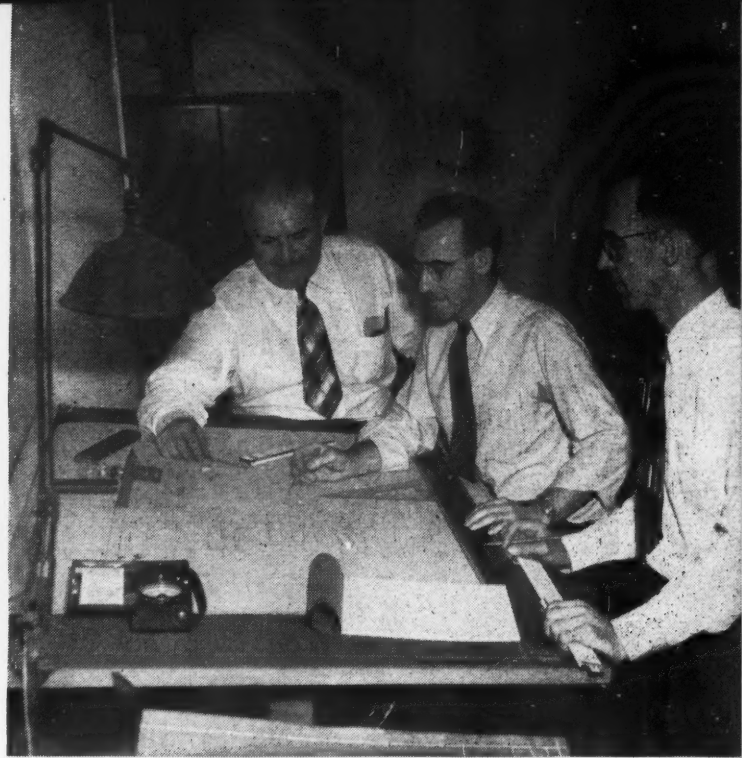
On many *Planned Lighting* systems some or all units are of the recessed type. Different installation techniques are required depending on whether the ceiling is wood, plaster, acoustical material, concrete or some other building material. On these jobs the units may be incandescent or fluorescent, and may be individual units or continuous row equipment. Each type of equipment usually requires a different method of installation, and each recessed job must be properly installed so that heat will be dissipated satisfactorily to prevent damage to the building or to the equipment.

Architectural elements such as coves, coffers, soffits, niches, etc., usually are lighted with concealed lighting equipment, consisting of strips, reflectors, wiring channels, etc. This equipment is often required to be held securely at a predetermined angle, and must be installed in an exact position so that it is not visible above a specified sight line. This type of installation requires methods entirely different than other forms of lighting.

One of the newer lighting techniques which is being adopted rapidly is the louverall ceiling. This system of lighting uses reflectors located above a suspended egg-crate type louver ceiling. The louvers are usually supported on a framework of steel angles or T-bars, which must be expertly installed so that the bottom of the louvers presents an even and uniform flat surface. Luminous ceilings formed



CONTINUOUS ROW FLUORESCENT units must be carefully installed in a straight line and level.



ELECTRICAL FOREMAN reviews plans with engineer and salesman before planning installation work.

with translucent glass or plastic are installed in the same manner. These systems require expert workmanship in both the installation of the lighting equipment and of the louvers or luminous elements.

Regardless of the type of *Planned Lighting* system sold, the electrical contractor must maintain a staff of trained mechanics capable of doing the entire electrical construction and installation work required. He must have the necessary tools and equipment required to enable the mechanics to do a first class job. He must have capable engineers and foremen qualified to give expert supervision and planning to the job to see that the work is done as planned and that it progresses without costly delays. The right material must be on the job at the right time.

It will be found worth while for the electrical foreman to go over each *Planned Lighting* job sold as often as may seem necessary with the salesman who sold the job and with the lighting engineer who planned it, to discuss any new types of lighting equipment or application techniques with them which may be involved. The foreman should know exactly what lighting result is planned, how the lighting equipment works to provide this lighting result, and how it must be installed to accomplish the desired result. By discussing such problems thoroughly, many costly errors may be prevented as the job progresses.

On relighting jobs, it is important that a complete check be made on the old wiring system, and also on the construction of the old building where the new lighting system is to be installed. The check on the old wiring will provide full information regarding the type of service available. It will indicate the condition of any existing wiring or conduits which may be salvaged and used in the new wiring system. The check on the building construction will reveal structural problems which will be encountered in the installation of both the wiring system and of the lighting equipment.

The importance of special training for all personnel of *Planned Lighting* contractors cannot be overstressed. The salesman needs training in both sales and lighting. The

engineer needs training in lighting. The electrical foreman needs to keep abreast of lighting practice as well as electrical construction work and code requirements. The mechanics need to be specially trained in both electrical and structural work, to keep them fully qualified to meet the many installation problems encountered on every new job and on new lighting techniques used.

Training in lighting fundamentals and lighting application is sponsored in many of the larger metropolitan areas by Sections or Chapters of the Illuminating Engineering Society, and in several vocational schools and colleges. In smaller communities where this type of training is not available, it can be sponsored by the electrical league, or by the local electrical utility company. In any community where the need for such training is made known, sponsorship can usually be found.

Sales training is available to every lighting salesman from nationally known correspondence schools, at least one of which has a special lighting sales training course available. Any investment of money and time in such training will pay for itself many times over.

Special training for electricians and installation mechanics can be company-sponsored in each electrical contracting organization. Many electrical contractors already sponsor such training courses. Some of these courses are designed for training apprentices, but might well be broadened to cover training for the entire personnel in the electrical construction and installation departments. Some of the more experienced and older journeymen can serve as instructors, and representatives from outside, such as from the local municipal electrical inspection department, can usually be obtained to discuss special problems such as the National Electrical Code and local electrical codes.

The far-sighted electrical contractor does not miss any opportunity to sponsor any activity which will keep his personnel adequately trained, and which will promote outstanding electrical construction and installation work by his company, which will benefit his customers and contribute to their greater satisfaction in the work he does for them.



MAINTENANCEMEN wash, clean, relamp and repair fixtures periodically for each Planned Maintenance Contract customer.

The Electrical Contractor . . .

Organized for Planned Lighting MAINTENANCE

THERE is a real need for a specialized Planned Lighting Maintenance service in every community. Careful analysis of the operation of such specialized maintenance indicates that it can be made highly profitable for electrical contractors in communities of 5000 or more.

Every lighting installation, large or small, must be maintained. Lack of maintenance wastes money. It results in loss of light up to 50 percent. It impairs vision, cuts down employee efficiency, and slows up production. Faulty or defective parts, if not replaced or repaired, usually result in further damage. Since the introduction and widespread adoption of fluorescent lighting equipment, specialized lighting maintenance assumes greater importance.

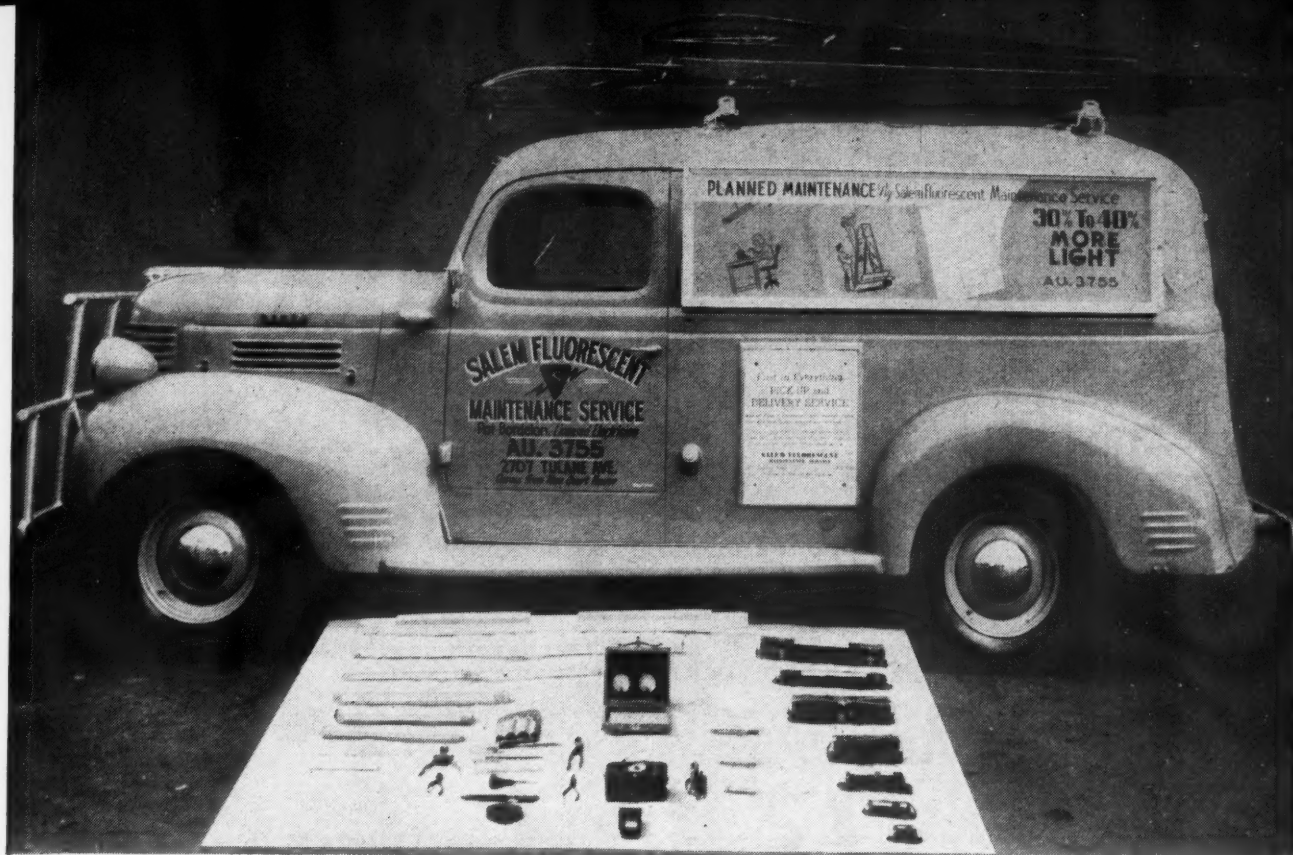
Electrical contractors who are organized to sell, design and install *Planned Lighting* systems are ideally organized for adding a specialized lighting maintenance service. They already have the qualified sales personnel needed to sell maintenance contracts. They already stock lamps, ballasts, starters, and many other repair parts required for maintenance service. They also have the necessary purchasing, billing, bookkeeping and related office facilities. Supervision of the added maintenance service can usually be handled by the lighting salesman, or by the owner in

small organizations. The investment in special trucks, tools, test equipment and additional personnel can therefore be kept at a minimum and easily justified.

Key to the successful operation of a *Planned Lighting* maintenance service is specialization, and the rendering of prompt and reliable service to the customers at all times. The service must be well thought out and properly planned to provide maximum service and attention to all customer calls. Qualified lighting contractors already have the technical know-how and specialized knowledge needed for servicing the wide variety of types and sizes of lighting equipment, and servicemen can easily be trained to do this type of work efficiently.

Planned Lighting maintenance service is normally operated by lighting contractors as a separate department, in order to develop and maintain the necessary degree of specialization and prompt service. Maintenance is normally sold on an annual contract basis, with the contract price being determined by the number, size and type of lamps installed in the customer's lighting system.

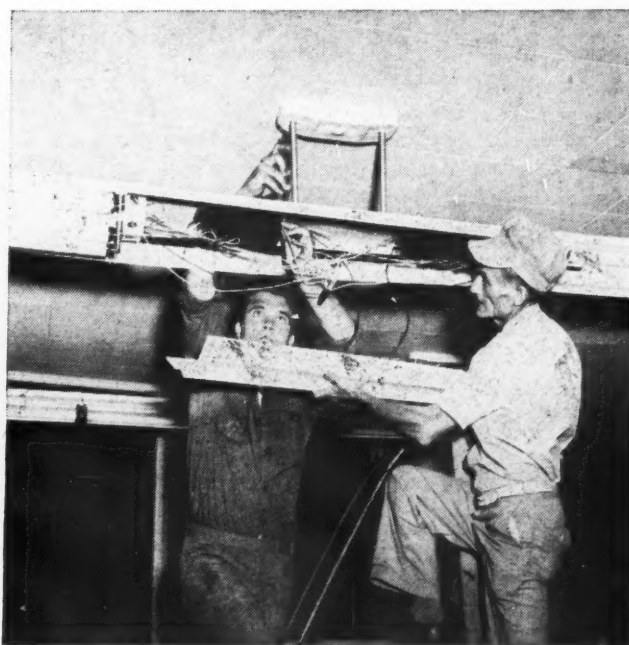
Contract agreements are best sold through personal calls. Direct mail promotion can also be used effectively to locate prospects. Regular *Planned Lighting* salesmen can sell



THIS TYPICAL PLANNED LIGHTING Maintenance Service truck, owned and operated by Salem Fluorescent Maintenance Service, New Orleans, is equipped with ladders, complete test equipment, repair tools, and complete stock of fluorescent parts.



ELECTRICAL CONTRACTOR'S SALESMAN closes a *Planned Lighting* Fluorescent Maintenance Service contract.



MAINTENANCE SPECIALISTS dismantle a fluorescent lighting fixture to change a ballast.

maintenance contracts when soliciting relighting jobs, and to the owners of new lighting installations.

A preliminary survey of a prospect's lighting system by the lighting salesman and lighting engineer will provide pertinent data on the lighting system, such as the existing lighting intensity, number and type of fixtures and lamps involved, and an approximation of the light depreciation. If the lighting system is inadequate, the owner is a prospect for relighting. If it would be considered adequate after proper cleaning and maintenance, he is a prospect for a maintenance contract. Data obtained through such surveys

can be filed and thus provide excellent case histories when combined with future surveys made after maintenance schedules have been established and put into operation.

Major lamp manufacturers all have available detailed maintenance service programs, including promotional material for direct mail promotion, spot radio announcements, suggested letters to prospects, prospect cards, maintenance contract forms, etc. The Salem Fluorescent Maintenance Service, New Orleans, whose operation is shown, operates under the Sylvania Fluorescent Maintenance Plan, which is typical of the plans available.

The Electrical Contractor . . .

KEY Man



CENTER OF *Planned Lighting* activity in every local community is the Electrical Contractor . . .

THE responsibility for effective lighting under present lighting techniques center in the application. Planned lighting is essentially applied lighting. The division of the job into fixtures, lamps, wiring materials, engineering, labor, etc. are arbitrary. No such division of activity or responsibility is practical since each portion of the work is dependent upon all others. The contractor is by logic and in practical reality the hub of the electrical industry's system of materials distribution, engineering and application.

When lighting was a relatively feeble compromise with the dark, when an orderly pattern of fixtures of pleasing appearance and reasonable light output was the best the industry could provide, the selection of lighting equipment and its installation were readily divisible. It was not uncommon to leave the selection of the lighting equipment until late in the construction programs. Style, appearance and price were compelling considerations since the range of available values of intensity and quality of light were narrow.

Under such conditions lighting and fixtures were synonymous, installation was incidental. The contractor

often had little more than a nominal role in the selection and purchase of lighting fixtures.

Modern planned lighting, however, involves such close coordination between selection of fixtures, layout, installation and wiring that these must be handled under single responsibility, and the essential position of the electrical contractor in carrying that responsibility gives him the key role in planned lighting sales.

Emphasis is necessary on the contractor's key position in lighting because it is not fully realized even among the contractors. The implications of planned lighting equipment are not yet evident, but they are having extensive effects on traditional lighting sales methods.

It is the very essence of planned lighting that the equipment selection, wiring and installation produce a predetermined lighting result. In order to do this, it is essential that the dealer, contractor or business organization be equipped and staffed to perform the work. There are many hypothetical organizations which could be erected to do the job, but once established they would be in personnel and function practically identical with already existing and well established electrical construction firms.

in **PLANNED LIGHTING**

It is necessary, however, that the electrical contractors accept a much greater share of the sales responsibility for planned lighting if lighting sales are to approach the market potential and if lighting progress is to achieve its obvious destiny. This development is already in motion. Electrical contractors over the country are equipped to do an across-the-board job on planned lighting, a substantial number are putting strong sales efforts behind their lighting activity. Their efforts need full industry backing and understanding if they are to reach full effectiveness.

The contractor's sales efforts are in no way a substitute for well developed sales programs by other industry elements. As soon as the contractor is clearly recognized as the "dealer" organization of the lighting industry the patterns for coordinating lighting sales programs on common objectives can become sharply defined and powerfully effective. The role of the utility and the wholesalers become distinct.

During recent years, especially since the introduction of fluorescent lighting, some producers and distributors have resorted to the practice of selling lighting equipment direct to the ultimate consumers. They have by-passed the electrical contractor. In most cases this practice has been resorted to because of keen competition and on types of equipment which have not been good selling items. But the customers who have bought lighting equipment direct from producers and distributors have been unable to by-pass the electrical contractor. The lighting equipment had to be installed and the building had to be wired. This is electrical construction work, highly specialized, which must be done in conformance with local and national electrical codes. The individual who does this work may be termed a wiring specialist, a lighting equipment installation expert, or any other similar term. But in the final analysis he is doing electrical contracting work. These lighting customers who

purchased lighting equipment direct from producers and distributors were placed in the embarrassing position of having to call in their local electrical contractor to wire for and install lighting equipment which should have been bought from him in the first place. Also, in case of failure of any of the lighting equipment, the electrical contractor had to be called to make replacements.

Analysis of the economics of sell Planned Lighting shows that the customer can buy a better lighting job for less money by dealing direct with his local electrical contractor. The electrical contractor is in a position to select and specify the exact type of lighting units and components which will best solve the customers' lighting problems. He can quote a price on the entire job, covering lighting equipment, installation and all necessary wiring. Since he is able to quote on the complete job, and can sell and install the complete job, he is able to pass on to the customer any savings which may thereby be effected. This also makes it possible for him to close the entire order when the recommendation is made.

The lighting sales manpower of manufacturers, wholesalers and electric utilities is limited. To attempt to use this manpower to sell Planned Lighting direct to the consumer is wasteful. It can be used much more efficiently and effectively in training and assisting the lighting salesmen and lighting engineers in the electrical contractor organizations, who are already in daily contact with the prospects for Planned Lighting. These electrical contractor-paid lighting salesmen and lighting engineers will then be better trained and better equipped to do a much better Planned Lighting selling job. In this way a bigger and better sales force will be out selling the prospects more lighting equipment and better lighting results. The contractors will benefit, the producers and distributors will benefit, and the customers will benefit.

... who is organized for prompt lighting installation and maintenance service.





SALESMAN ASSURES CUSTOMER satisfaction by checking new lighting results with owner.

Satisfied Lighting Customers

EVERY new lighting job becomes a visible monument to the professional and organizational skill of the contractor, and is seen by many people. Like architecture, or an engineering structure, if the lighting result is good, the installation will create favorable comment. If the lighting result is poor, or inadequate, the installation is an existing monument of an improperly planned job. Each properly planned job helps sell another. Jobs which are outstanding and unusual set new standards of lighting, and automatically make older jobs in the same locality obsolete.

A lighting contractor's greatest asset is a long list of satisfied lighting customers. Word of mouth praise for the contractor's work by satisfied customers is the contractor's best recommendation. Thus quality lighting, of proper intensity, correct distribution, low brightness ratios, popularly termed *Planned Lighting*, should be sold on each and every job. Sacrifice of quality in the lighting result for the sake of lower cost cannot be justified for either the owner or the contractor. Such sacrifice invariably leads to a dissatisfied lighting customer, and results in an existing monument to which the contractor cannot point with pride.

It must be remembered that a good lighting job can and will be "seen" by many potential customers. A good lighting installation is also a good recommendation for other types of electrical work which cannot be seen, such as wiring, maintenance and repair.

The lighting salesman can do much to create satisfied lighting customers. After a new lighting system has been installed, the far-sighted salesman calls on the customer and points out the many features of the job. With a light meter he demonstrates that adequate intensity has been provided throughout all areas, and that the lighting is uniform, and well diffused. By manipulating switches, he demonstrates the flexibility in lighting results which have been provided by proper planning of controls. He also discusses wiring adequacy, color quality of the illumination, elimination of glare and how it was achieved, and all other features which were incorporated in the job through expert analysis of the lighting problem and proper planning by the engineer. He demonstrates to the customer that the best job possible has been done, at the lowest possible price, commensurate with the lighting problem which existed and sound engineering practice.

An opportune time to discuss *Planned Lighting* maintenance with the customer is at the time of completion. Initial footcandle intensities can be demonstrated.

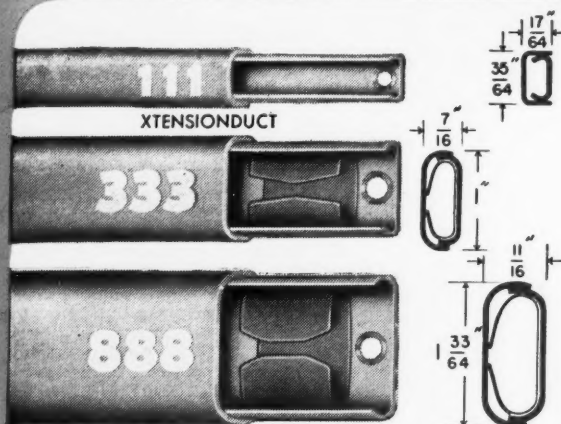
Many lighting contractors now offer a one year guarantee on electrical work and lighting equipment. When this is done, it should be pointed out to the customer again upon completion of the job. This, plus stressing the many qualities built into the lighting installation, will do much toward making a satisfied customer, and toward building good will which will result in additional business.

New approved WIRE FILLS

for National Electric SURFACE RACEWAYS

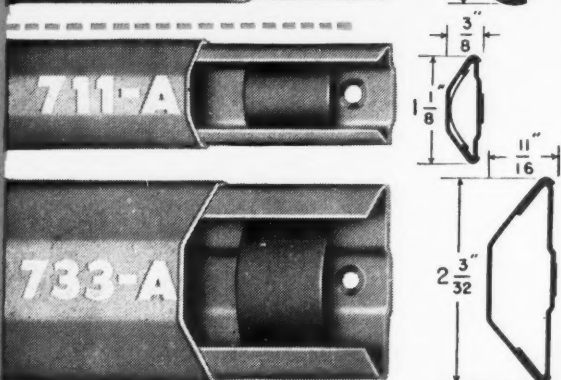
Based on current-carrying capacities listed in 1947 National Electrical Code

Metal Molding



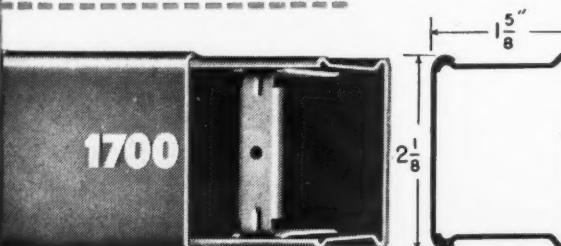
Cat. No.	Wire Size—AWG	Max. Number of Wires Types	
		R or RH	T or RU
111	14	3	3
	12	2	3
333	14	7	9
	12	6	8
	10	3	6
	8	2	3
888	6	—	2
	14	10*	10*
	12	10	10
	10	9	10
	8	7	10
	6	4	5

Florduct



Cat. No.	Wire Size—AWG	Max. Number of Wires Types	
		R or RH	T or RU
711-A	14	7	9
	12	4	5
	10	2	4
	8	2	3
733-A	14	10*	10*
	12	10	10
	10	10	10
	8	7	10
	6	4	6

Surfaceduct



Cat. No.	Wire Size—AWG	Max. Number of Wires Types R, RH, T, or RU	
		With Devices	Without Devices
1700	14	10*	10*
	12	10	10
	10	10	10
	8	10	10
	6	10	10

*National Electrical Code limits duct fill to 10 conductors

All NE Surface Raceways are two piece-base and capping—designed on the "lay-in" principle—

- Lay in the wires, snap on the capping
- No fishing required
- Installation, additions and changes are quick and easy

All approved by Underwriters' Laboratories, Inc.

Steel for permanence—
Grounded for Safety



Sold
through
leading
wholesalers

National Electric
PRODUCTS CORPORATION
PITTSBURGH 30, PA.



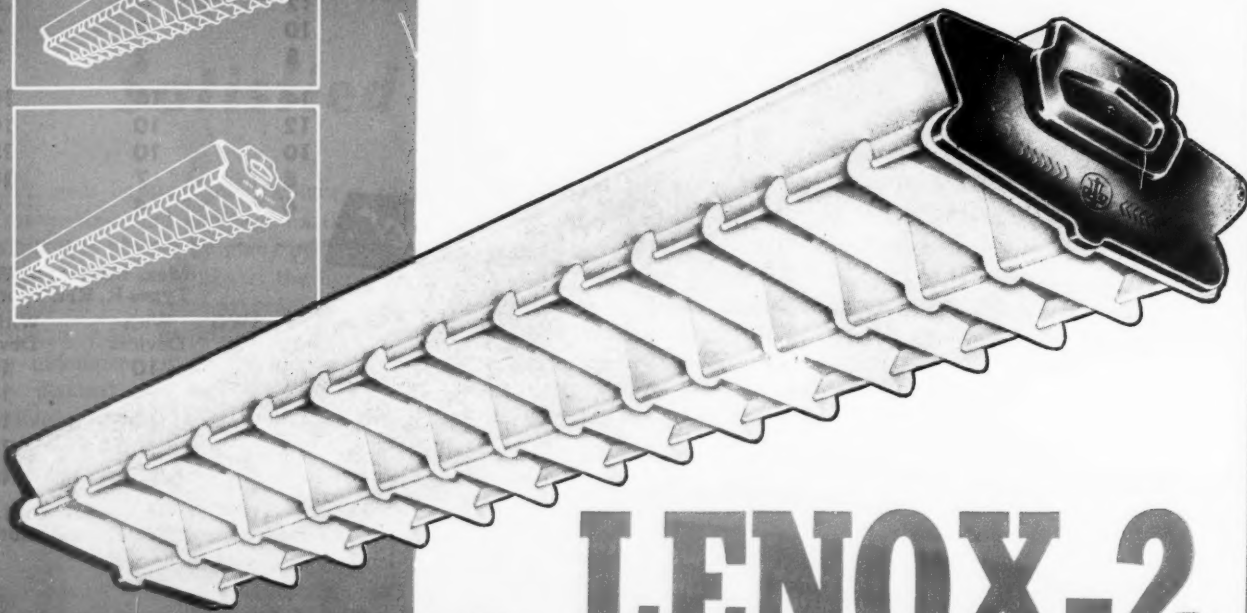
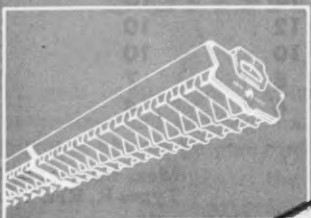
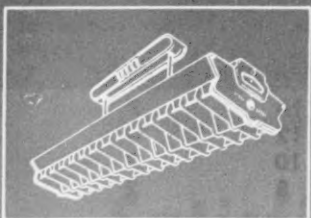
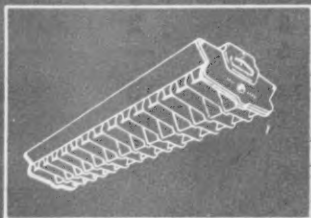
MEET THE NEW DAY-BRITE "TWINS"

... PERFECTED AFTER TWO YEARS OF INTENSIVE RESEARCH

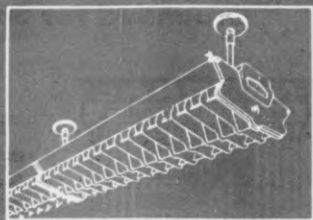
2 SIZES—The LENOX-2 for two 40-watt lamps; the LENOX-4 for four 40-watt lamps

2 MOUNTINGS—both the LENOX-2 and the LENOX-4 may be either ceiling or suspension mounted

2 INSTALLATIONS—both the LENOX-2 and the LENOX-4 may be used as single units or in continuous runs



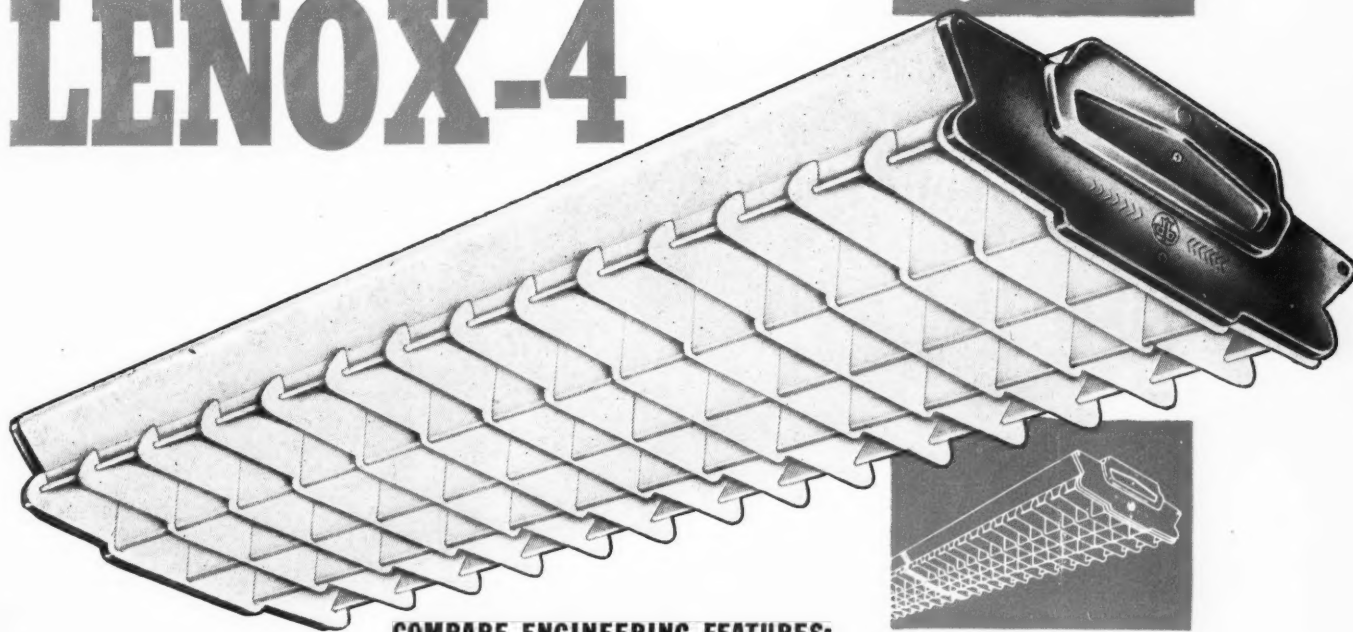
the **LENOX-2**



T. M. Reg. U. S. Pat. Off., Patents Pending

Here's new lighting efficiency . . . new maintenance ease and economy . . . new functional styling (distinctive but not too extreme) to blend beautifully with modern architectural trends in stores, offices, schools, public buildings. And all at competitive prices!

the LENOX-4



COMPARE ENGINEERING FEATURES:

- ▶ New design combines high efficiency with low brightness ratios for comfortable seeing
- ▶ All-steel construction throughout. Interlocked louvers make enclosures one rigid unit
- ▶ Enclosures snap on and off instantly, supported by chains for quick, easy servicing
- ▶ Side panels and louvers finished in baked SUPER-WHITE enamel, with baked lustre aluminum enamel end caps and plates
- ▶ Wired with approved type ballasts, sockets and no-blink type starters
- ▶ Rugged chassis with plenty of knockouts—every detail designed for economical installation and maintenance

May we send you Bulletin 10-E and 10-F with complete details?



318



Day-Brite Lighting, Inc., 5402 Bulwer Avenue, St. Louis 7, Mo.
Nationally distributed through leading electrical supply houses.
In Canada: address all inquiries to Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

Announcing two new colors in G-E fluorescent lamps!



1. New G-E "Soft White"

The latest in fluorescent, the most flattering light of all! Here's a new, soft light that is fresh and clear—that does wonders for homes, restaurants, stores, and theaters. Tests with thousands of people prove it ideal for complexions. And it's complimentary to foods and surroundings. Developed after years of research with hundreds of color combinations, it's the newest thing in fluorescent.

2. New G-E "Warm Tint"

Gives you color values similar to incandescent! Provides a warm, rich light that creates a friendly, intimate atmosphere and softens many colors and decorative schemes. G-E warm tint combines the warmth of incandescent lighting with the modern appearance, softness, and high efficiency of fluorescent. Blends perfectly with incandescent lights used in floor lamps and other fixtures.

These two new lamps are important additions to General Electric's fluorescent lamp line, which now gives you a wide choice of "whites" (daylight, 4500 white, white and the new soft white and warm tint) as well as the standard colors.

On every lighting job, always recommend the lamps with this mark of quality



G-E LAMPS
GENERAL  ELECTRIC

Ceilings **ACCOMPLISHED** WITH THE *NEW All-bright* LUMINAIRES

for symmetry and
unlimited design



EXECUTIVE SLIMLINE

EXECUTIVE SLIMLINE
2 and 4 lamp 96 inch. 100, 200, or 300 M.A. Glass
or louvered bottom, continuous rows or individual
mounting.

EXECUTIVE FLUORESCENT
2 and 4 lamp 40 watt. Glass or louvered bottom or
individual mounting.
Both units feature extreme shallowness. 4 inch over
all depth. Convex Albalite-Corning side panels.

A.F. of L. wired and
fabricated.
E.T.L. and U. L. approved.



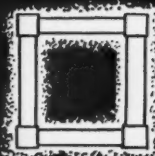
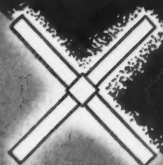
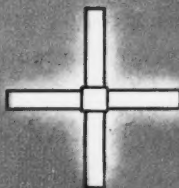
EXECUTIVE FLUORESCENT

Junction unit fluorescent XUX 214 for use with 2 lamp
unit, XUX 415 for use with 4 lamp unit. Can be installed
in between units as illustrated below. Only one outlet
required for complete design. Available for use with
one to four PAR 38 spot lamps.

Guarantee

Guarantee: All-Bright fixtures are guaranteed to be free
from defective material and workmanship. The All-Bright
Electric Products Co. agrees to furnish a new part in exchange
for any part of this fixture which, under normal installation,
use, and service disclosed some defect within one year from
date of installation, provided your local supplier is notified
with full particulars within this period. This guarantee void
if card attached to unit is not properly filled out or if fixture
is sold outside the United States.

The all-bright guarantee
means full protection.

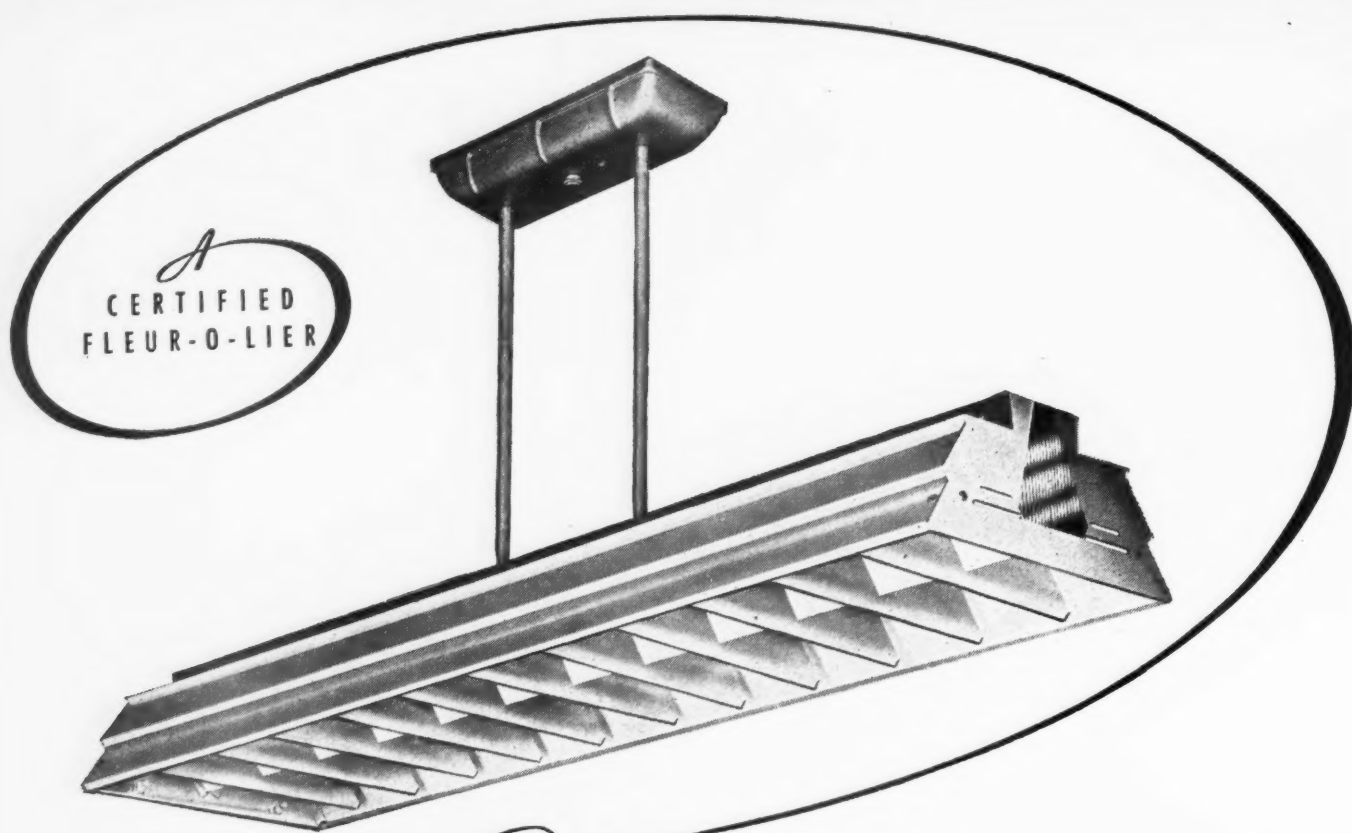


ALL-BRIGHT ELECTRIC PRODUCTS COMPANY

Manufacturers
of Fluorescent
Lighting Fixtures



3917 25 N. Kedzie Ave. Chicago 18, Illinois



The Meritliter 500 Series

FOR SCHOOLS • OFFICES AND LOCATIONS WHERE
ILLUMINATION IS OF UTMOST IMPORTANCE.

THROUGH an original and unique design of SHIELDING, the Meritliter 500 Series produces an illumination that is easy on the eyes, yet exceptionally efficient according to lighting standards. Available in two or three 40 watt lamps.

All metal sides are of two-piece construction, to produce an edge-glow effect combined with a hinged louver bottom of 35° transverse and 25°—30° longitudinal light cut-off.

These certified Fleur-O-Lier's are so constructed as to meet all safety requirements plus low installation and maintenance costs.

The appearance is excellent as the entire fixture is finished in Endur 300° white, with removable end ornaments of chrome for end to end mounting.

For improving present lighting conditions or for new construction, get in touch with an Ender lighting specialist.

Write today for a folder describing the Meritliter 500 Series and complete E.T.L. reports.

ALL ENDER LIGHTING FIXTURES ARE E.T.L. TESTED

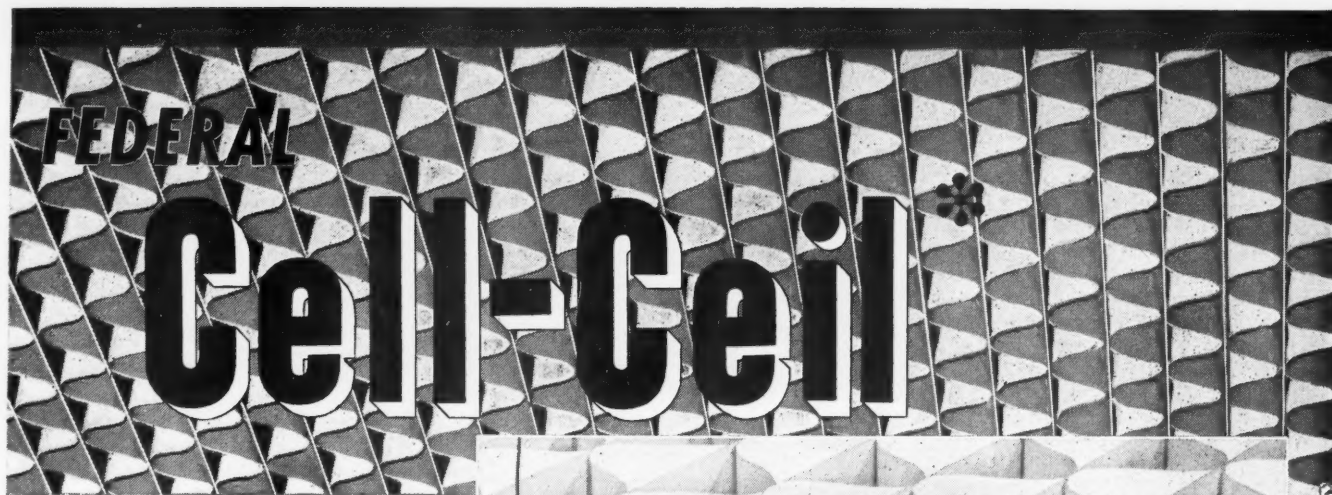
ENDER MANUFACTURING CORP.

260 West Street

Dept. 700b

New York 13, N. Y.

DISTRIBUTED ONLY THROUGH LEADING ELECTRICAL WHOLESALERS



for **EASIER INSTALLATION**

Quicker SALES

The simple sturdy hanging mechanism for Cell-Ceil® makes installation easy for the contractor—gives the building owner quick results. It's easier to sell Cell-Ceil for quick completion of jobs can be assured.

Better PROFITS

Lighting profits now from wall to wall! Cell-Ceil installations, easier to sell, easier to install, will add real volume to your lighting sales. Unprecedented interest being displayed by building owners in this new all steel louvre unit prove it to be one of the major steps in the history of lighting. This aroused interest means real profits to you.



Cell-Ceil comes in harmonious decorator colors. It is made of Acme Galva-Bond Steel**, that offers protection against loss of color or corrosion. These Cell-Ceil sections cannot warp. They are lightweight sections, suspended from overhead, simplifying installation in new construction or remodeling. All sections match perfectly . . . give continuous one-piece look . . . hide ceiling pipes

—sprinkler heads—ventilating ducts . . . yet provide easy access for relamping and cleaning.

Architects, designers, and building interests are being told about Cell-Ceil *every month* in:

Architectural Forum Progressive Architecture
Architectural Record Interiors

We suggest you mail in the coupon for our Cell-Ceil Technical Bulletin on installation techniques.



FEDERAL ENTERPRISES, INC.

Formerly Federal Electric Company, Inc.

8700 SOUTH STATE STREET

CHICAGO, ILL.

*Trade Mark applied for.
**T.R. Acme Steel Co.

COUPON

Dept. CCT-2
Federal Enterprises, Inc.
8700 S. State St., Chicago 19, Ill.
Please send your Cell-Ceil Technical Bulletin on installation techniques.

NAME _____ POSITION _____
FIRM _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

Planned

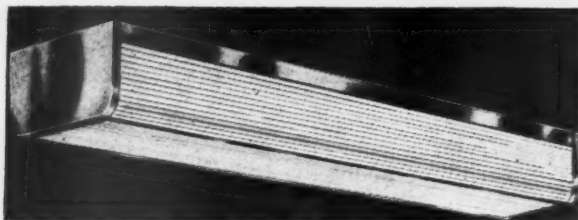
LIGHTING INSTALLATIONS

CAN BE PROFITABLE *with*

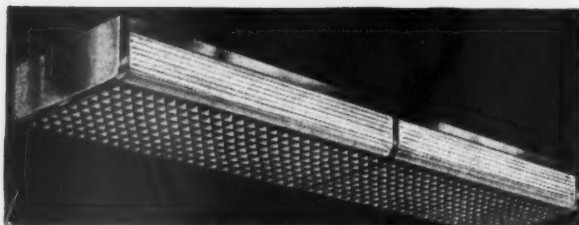
PITTSBURGH PERMAFLECTOR

LIGHTING EQUIPMENT

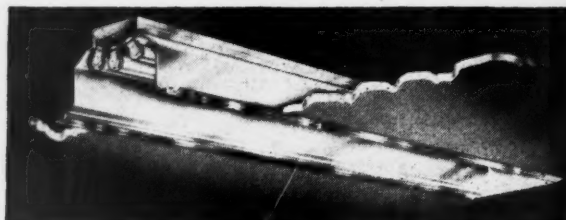
FLUORESCENT LIGHTING



THE "GRANT" LUMINAIRE is typical of the Pittsburgh Permaflex Presidential Luminares available in 2, 3 and 4-lamp models for surface or pendant mounting, individually and in continuous row. Flexible in application, these units are particularly suitable for store and office lighting and other applications where appearance is paramount and facility of maintenance is desired. Companion incandescent equipment is obtainable for use with this series.



THE "WASHINGTON" SLIMLINE LUMINAIRE is one of the 96" Presidential Series units for surface or pendant mounting, individually or in continuous row. When surface mounted the "bridge-truss" chassis construction insures snug ceiling fit and results in a "built-in" look. These units are available in 3 and 4-lamp models with 200-MA ballasts. Companion incandescent units are also obtainable for use with this series.



THE "UNIVERSAL" TROFFER is a completely flexible unit which may be ceiling recessed individually, in continuous rows, patterns, squares and other arrangements to suit the requirements of the user. The basic "Universal" troffer-chassis can be used as an open type troffer but it can also quickly and easily be equipped with any of the following shielding accessories: egg-crate louver, Alba-Lite glass panel, baffle-louvers or lens panels.



THE "200" SERIES ADJUSTABLE DOWNLITE is typical of the companion incandescent units designed for use with Pittsburgh Permaflex Fluorescent Equipment when "accent" or spotlighting is desired. The downlight illustrated rotates in a complete circle and fixes at any position up to 30° from its vertical axis; it is used in end, in-line, cross-over, corner and "T" arrangements with troffer installations.

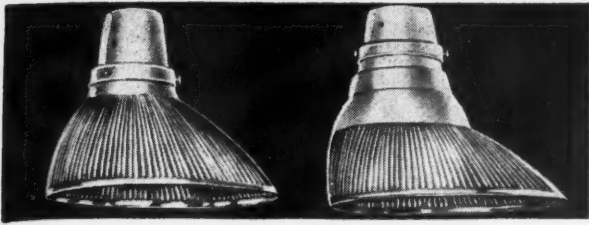
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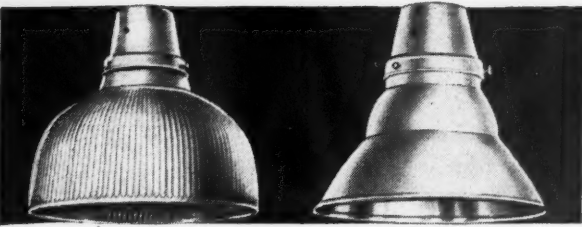
INCANDESCENT LIGHTING



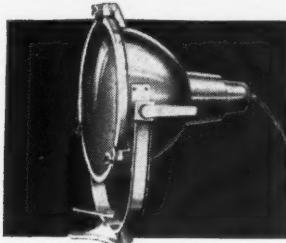
SHOW-WINDOW PERMAFLECTORS, the permanently efficient silvered glass reflectors backed by a ten year guarantee, are available in various combinations for lighting shallow, island, medium and deep windows of low, medium or high ceiling heights. The flexibility of Permaflector Show-Window Equipment permits many varied arrangements . . . all of which can be easily and quickly achieved with the standard units.



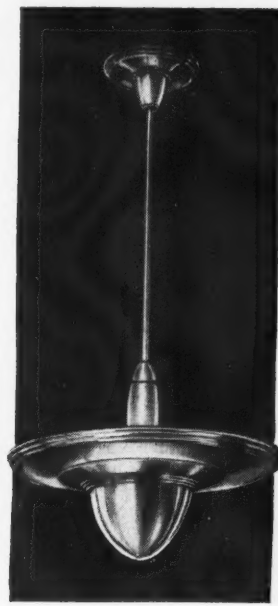
HIGH-BAY INDUSTRIAL UNITS, in enclosed or open types utilizing incandescent and/or mercury vapor lamps, are designed especially for high-bay lighting, gyms and similar applications.



CEILING RECESSED PERMAFLECTORS of broad or concentrated distribution for all types of mounting arrangements and for every interior lighting application are part of the standard Pittsburgh Permaflector Incandescent line. Combinations are available for external mounting, as well as recessed ceiling installations. A wide variety of accessories meets the specific illuminating requirements of any and all types of interiors.



WEATHER-PROOF FLOODLIGHTS of rugged aluminum construction are available in 200-W to 1000-W units. Precision engineering assures dependable illuminating results.



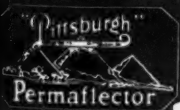
INCANDESCENT LUMINAIRES for direct or indirect lighting with direct component, are in the standard line. Units have spun aluminum housings and silvered-glass Permaflectors.

"There Is a Permaflector for Every Purpose"

When you sell Pittsburgh Permaflector Lighting Equipment you offer your customers the correct fluorescent and incandescent units—or combination of both—they need for producing the *exact* illumination required in all their applications. The Pittsburgh Permaflector line is the *only* complete line that meets every need.

"Planned Lighting" becomes a simple matter, quickly and easily obtained, through the use of standard Pittsburgh Permaflector Units . . . for this flexible incandescent and fluorescent equipment can be combined to achieve the visual and architectural results needed in each individual installation.

For full information about the completeness of the line, the many selling features and the broad profit possibilities in Pittsburgh Permaflector Equipment—write the home office. If you haven't the new Fluorescent Catalog 48-F or Incandescent Catalog 46, request it on your letterhead.



PITTSBURGH REFLECTOR COMPANY

OLIVER BUILDING • PITTSBURGH 22, PENNSYLVANIA

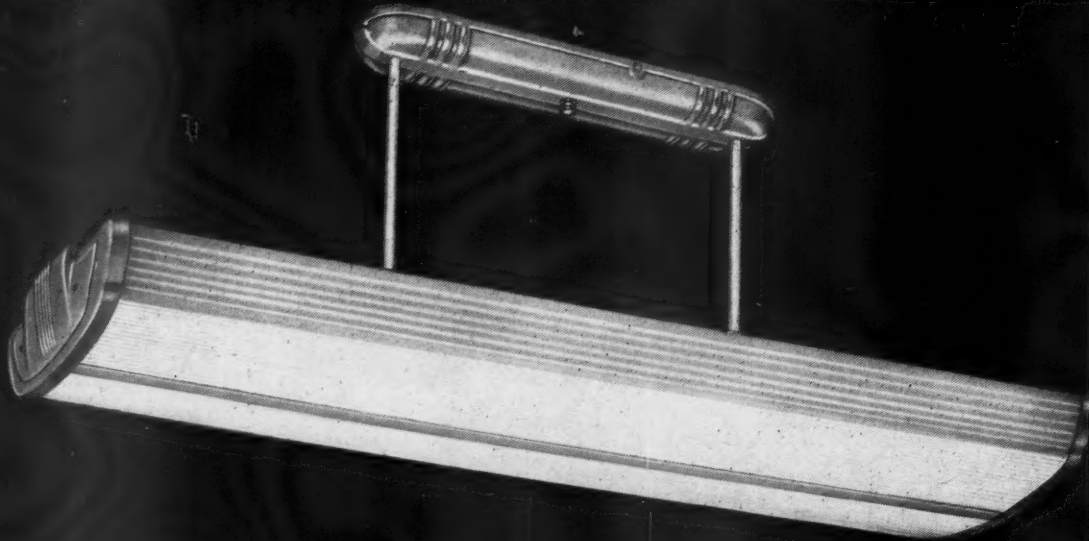
Manufacturers of Fluorescent and Incandescent Lighting Equipment

PERMAFLECTOR LIGHTING ENGINEERS IN ALL PRINCIPAL CITIES

DISTRIBUTED BY BETTER ELECTRICAL WHOLESALERS EVERYWHERE

Lighter weight - Lighter work...

THE NEW "CD SERIES" LUMINAIRES



FOR EASY HANDLING • QUICK INSTALLATION

SIMPLE MAINTENANCE

YOU CAN BE SURE...

IF IT'S

Westinghouse

Westinghouse
PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Never before have we announced a new fixture with such outstanding maintenance and installation advantages as the new Type CD-160 unit for schools and offices. It's a companion unit of the familiar CD-80.

The CD units have specific design and economic advantages for the contractor and maintenance superintendent.

1. Lightweight plastic makes handling easier, safer—speeds installation.
2. Lamps and starters replaced from the top without removing panels or louvers.
3. Units may be suspension, or close-to-ceiling, mounted; individually or in continuous rows.
4. Plastic and louver bottom panels are interchangeable.
5. Cleaning is easy—panels can be quickly removed and replaced.

6. The CD-160 (four 40-watt lamps) or the companion CD-80 (two 40-watt lamps) is ideal for any classroom or office layout.

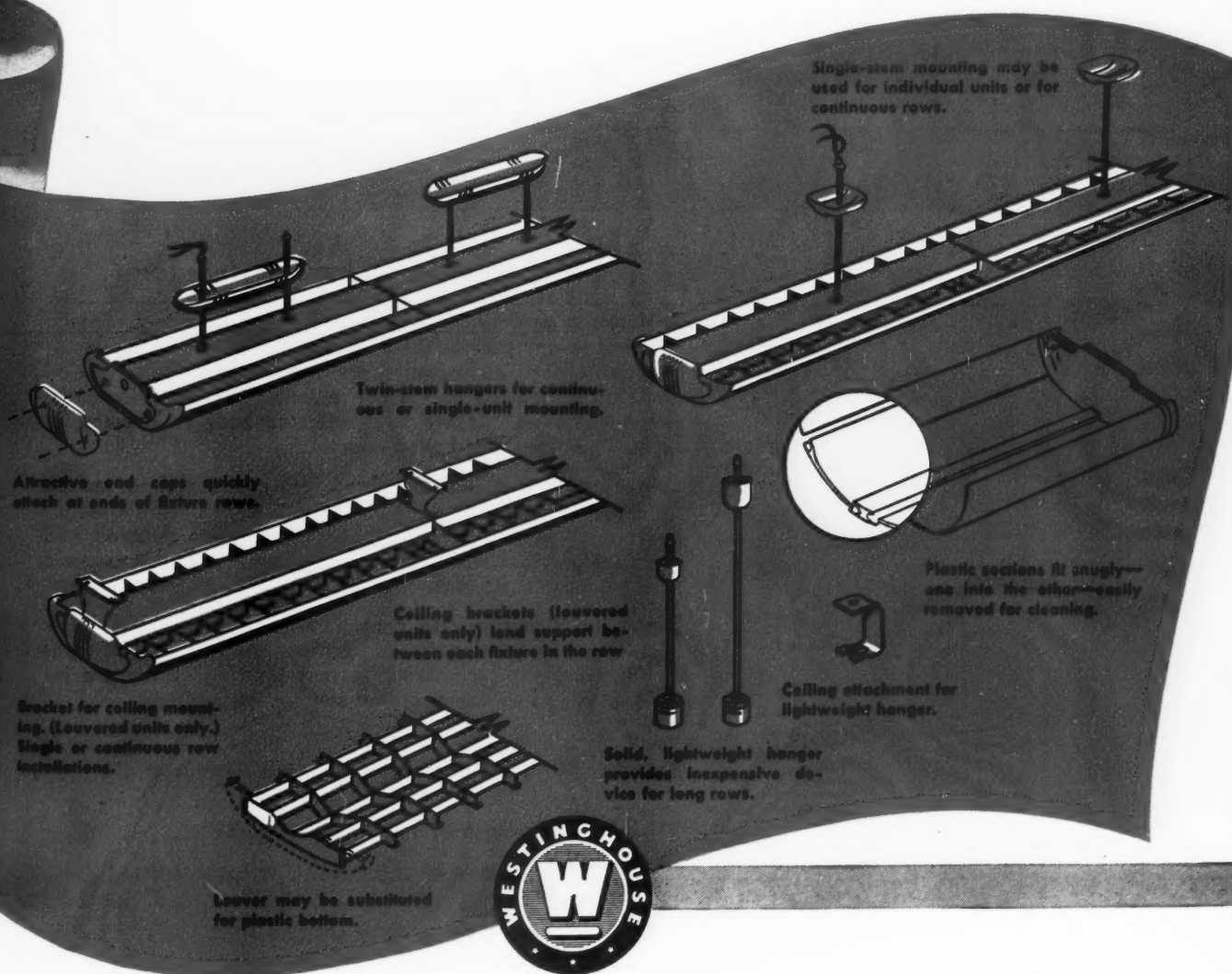
The CD-80 and CD-160 units are designed for efficient, economical illumination in schools and offices. They're safe, and easy to install . . . they're efficient in light distribution . . . and they're simple to maintain.

Call your Westinghouse Distributor today. A Westinghouse Lighting Engineer will gladly co-operate with you and your local Power Company in planning schoolroom or office layouts.

New "CD Series" Booklet Now Available

Write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa., for B-4075, "Type CD Series Fluorescent Luminaires".

J-04199



Planned Lighting *Pays*

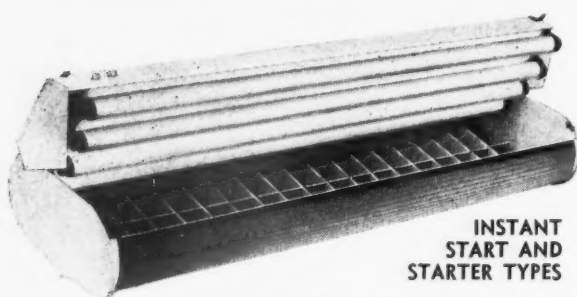
COMMERCIAL • INDUSTRIAL • FLOOD • STREET • AVIATION

CENTRALITE PRESENTS

The New LOUVRE QUEENS

for PLANNED LIGHTING PROFITS

LOW BRIGHTNESS—HIGHEST EFFICIENCY



INSTANT
START AND
STARTER TYPES

Designed for the Contractor

● Here's a modern fluorescent fixture that may be easily mounted in any position by one man without necessity of instruction sheets, additional couplings or parts. Units can be used for suspension or surface mounting individually or in continuous rows. Louvre and reflector body is finished in highest quality white baked enamel.

Louvre and end plates are made into one complete section for ease of installation and removal. Louvre is hinged to body which permits it to swing open for easy cleaning and lamp replacement. The top curved section of louvre is made of extruded plastic material which will not discolor or warp.


Simplicity of design and construction makes for easy—low cost—planned lighting profits. Fixtures available for all types of mounting with or without instant starting. Units are individually packed ready for immediate installation.

Write for catalog illustrating and describing the complete line of Centralite commercial and industrial fluorescent fixtures.

SOLD THROUGH ELECTRICAL WHOLESALERS

MODEL 240CLS

TYPE OF LIGHT
DISTRIBUTION



CEILING

75%

30%

10%

50%

30%

10%

30%

10%

WALLS

Room Index

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COEFFICIENTS OF UTILIZATION

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ZONE

0° - 60°

0° - 90°

90° - 180°

0° - 180°

LUMENS

Lamp

Luminaire

Per Cent Total Lumens Bare Lamp

PER CENT LIGHT OUTPUT

1713

2191

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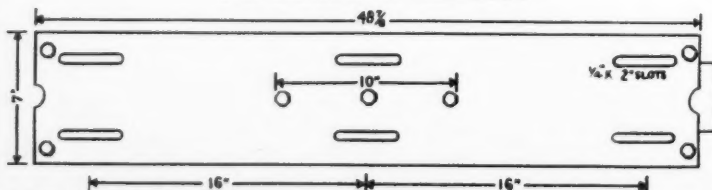
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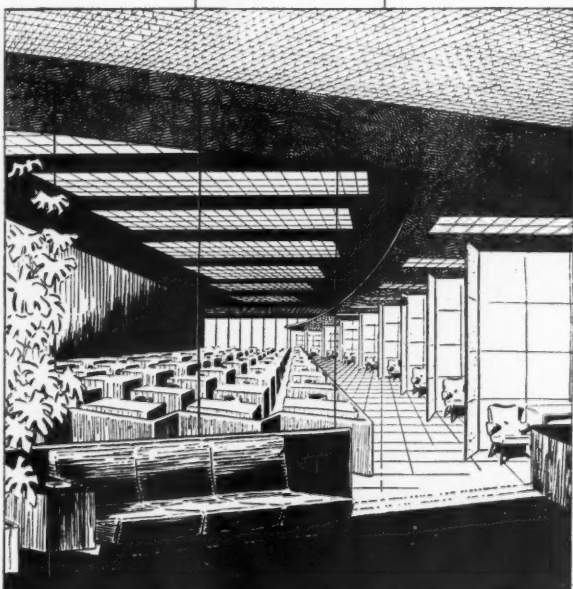
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MODEL 440CLS										
TYPE OF LIGHT DISTRIBUTION	CEILING		75%		50%				30%	
	WALLS		50%	30%	50%	30%	10%	30%	10%	
	COEFFICIENTS OF UTILIZATION									
	Room Index									
	J	.29	.26	.24	.27	.25	.23	.23	.22	
	I	.35	.32	.31	.33	.31	.29	.30	.28	
	H	.39	.36	.35	.36	.34	.33	.32	.31	
	G	.42	.40	.38	.39	.37	.35	.35	.34	
	F	.46	.42	.40	.41	.40	.37	.37	.36	
	E	.48	.46	.43	.45	.42	.40	.40	.38	
	D	.52	.48	.46	.47	.45	.43	.42	.41	
	C	.54	.51	.48	.49	.47	.45	.44	.42	
	B	.56	.53	.51	.51	.49	.47	.46	.44	
A	.57	.55	.53	.53	.50	.48	.47	.45		
LIGHT FLUX VALUES										
ZONE	LUMENS				Per Cent Total Lumens Bare Lamp		PER CENT LIGHT OUTPUT			
	Lamp		Luminaire							
	0° - 60°		3732		40.8					
	0° - 90°		6424		69.5					
	90° - 180°		1930		21.0		71.5			
0° - 180°		9200		6556		71.5				



CENTRALITE CO., CINCINNATI 14, OHIO
PIONEERS OF INSTANT STARTING

Unlimited patterns
of light from one
system of lighting—
CEILINGS UNLIMITED*



Office — Architects Van Doren, Nowland & Schlodermundt

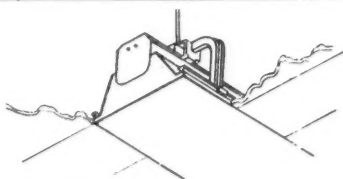
Good light . . . PLUS! Modernization of old interiors. Structural harmony in new construction. Simply by installing the units making up Miller Fluorescent Troffer Lighting Systems (versatility of application is boundless) in lines or blocks to form the ceiling pattern you desire. Good light . . . plus CEILINGS UNLIMITED.

Miller Lighting Service is all-inclusive. It covers the needs of planned Commercial and Industrial Lighting.

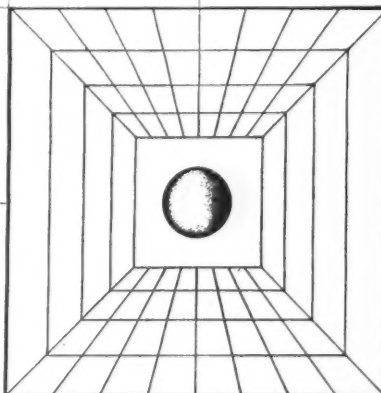
Miller 50 and 100 Foot Candles (Continuous Wireway Fluorescent Lighting Systems) are standard for general factory lighting. Miller incandescent and mercury vapor reflector equipment has broad factory and commercial application.

Miller field engineers and distributors, conveniently located, are at your call.

© Reg. Trademark U.S. Pat. Off.



Miller Ceiling Furring Hanger (patented) simplifies installation. Continuous wireway cuts wiring and fitting costs. Units Bonderized, rust-resistant. Accessible parts . . . easy service.



Chernysheff

THE MILLER COMPANY
SINCE 1844

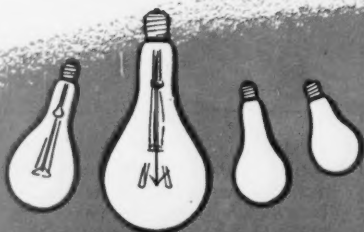
ILLUMINATING DIVISION: MERIDEN, CONNECTICUT

ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment; HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices; ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls

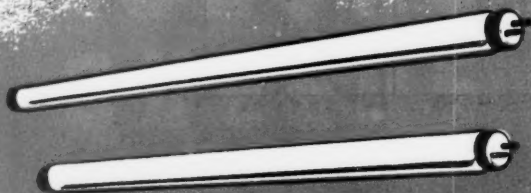
5

WESTINGHOUSE LAMPS

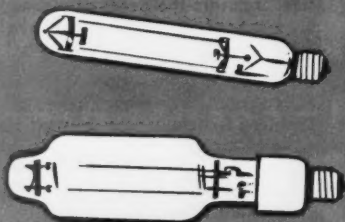
For



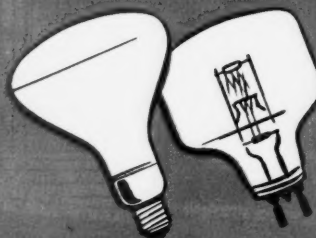
INCANDESCENT—Universally used for general lighting jobs, Westinghouse incandescent lamps are offered in sizes of 3 to 1500 watts with frosted, clear, or colored finishes.



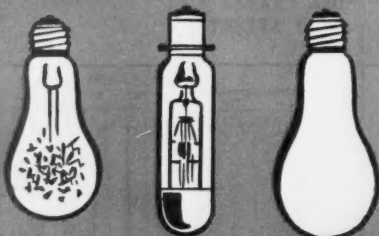
FLUORESCENT—Westinghouse high-quality fluorescent lamps are available in all sizes from 6 to 100 watts in white, day-light, soft white, and 4500 deg. white. Westinghouse slimline lamps are made in lengths from 42 to 96 inches. For more information, write for 24-page booklet, Form A-4759.



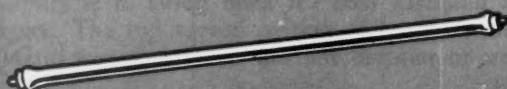
MERCURY VAPOR—Westinghouse, the foremost manufacturer of mercury vapor lamps, makes sizes of 100 to 3000 watts for general lighting, floodlighting, street lighting, photo chemical, photographic, and searchlight service. For more information, write for 24-page booklet, Form A-5112.



INFRARED—Available in sizes up to 1000 watts, Westinghouse infrared lamps are proving to be the simple, convenient, and economical source of heat for many baking, drying, and heating processes today. For more information, write for 16-page booklet, Form A-3817.



PHOTOGRAPHIC AND PROJECTION—High-quality Westinghouse flood, flash, enlarger, projection, and sound-reproducing lamps are available in all sizes for general and special applications. For more information, write for 20-page booklet, Form A-4754.



STERILAMPS*—Sterilamps, the Westinghouse germicidal lamps, are available with ratings from 4 to 30 watts. Only Westinghouse also offers the new slimline germicidal Sterilamp with new high intensity that cuts cost of protection in half.

*Reg. U. S. Pat. Off.

Westinghouse Lamps

PLANTS IN 25 CITIES • OFFICES EVERYWHERE

**WESTINGHOUSE LAMP
DISTRICT OFFICES:**

10 High St., BOSTON; 2260 Peachtree Industrial Blvd., CHAMBLEE, GA.;
20 N. Wacker Drive, CHICAGO; 40 Wall St., NEW YORK;
3001 Walnut St., PHILADELPHIA; 419 Wood St., PITTSBURGH;
410 Bush St., SAN FRANCISCO; 411 N. 7th St., ST. LOUIS.

Planned Industrial Lighting

The lamps you use are the key to the effectiveness and efficiency of your lighting system. When you use Westinghouse lamps you are assured of having the best lamps that modern engineering, manufacturing, and production methods can produce.

The right light for every industrial purpose. With 10,000 types and sizes of Westinghouse lamps to choose from, you can be sure of getting the right light for your purpose. A total of 486 tests and inspections from raw material to finished product assures you that every Westinghouse lamp you buy is of uniform high quality. Thousands of industrial users choose Westinghouse lamps for these reasons:

High light output

High light output maintained throughout life

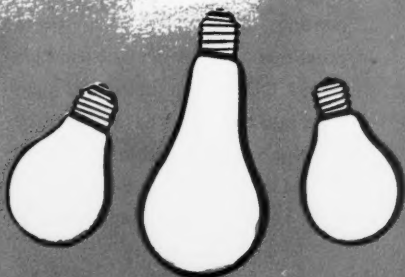
Uniform performance

Lamps made to close dimensional standards

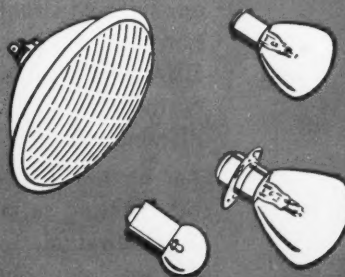
All types of lamps

Lamps embody all the latest improvements

Next time you buy lamps, specify Westinghouse—and get the most out of your lighting system. For complete product information, call your Westinghouse Lamp representative or write the nearest Westinghouse Lamp District Office.



SPECIAL SERVICE—Rough- and vibration-service lamps in 50- and 100-watt sizes are specially constructed to give long, satisfactory performance in punishing applications. High-voltage service lamps in sizes from 25 to 1000 watts are designed for use at 230 and 250 volts.



AUTOMOTIVE—All types and sizes of automotive lamps are available for cars, trucks, buses and tractors. Types include sealed-beam headlights, prefocused lamps, tail lights, panel lights, interior lights, and indicator lights.

SEND FOR FREE BOOKLETS

Check and mail the coupon today for your copies of this helpful information. Lamp Division, Westinghouse Electric Corp., Bloomfield, N. J.

Westinghouse Electric Corp.
Lamp Division, Bloomfield, N. J.

Please send me the free booklets I have checked below:

.....Fluorescent (A-4759)Infrared (A-3817)
.....Mercury Vapor (A-5112)Photographic (A-4754)

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

QUAD LIGHTING



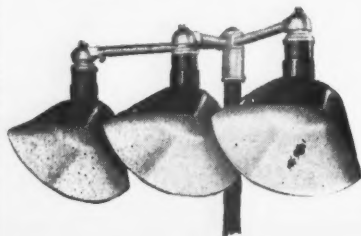
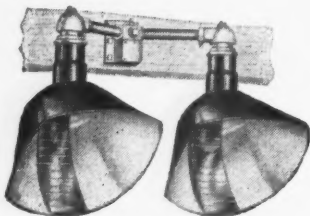
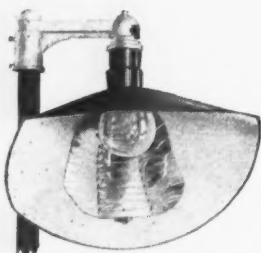
BASEBALL
FOOTBALL
HOCKEY
TENNIS
BOXING
GOLF PRACTICE

**COVERS
THE FIELD
OF SPORTS**



HORSE RACING
PLAYGROUNDS
SWIMMING POOLS
BATHING BEACHES
HORSE SHOE COURTS
MIDGET AUTO RACING

QUAD FLOODLIGHTS



• QUAD Floodlights cover the field in sales—they make it possible for you to adequately meet any lighting situation, or installation specifications. When you sell QUAD Floodlights you assure your customers of quantity and quality illumination.

Among the features which make this lighting so much in demand, are individual light control and multiple mounting, which afford the kind of flexibility that is so important in securing ideal results.

By means of a single head bolt, all QUAD Units may be adjusted 180 degrees horizontally and 40 degree vertically.

QUAD floodlighting engineers will be glad to offer suggestions and make recommendations based on wide experience in this field.

Memo

Dear Contractor..

The Fall season is on deck—the time when business speeds up. Most of us are back from fishing, golfing, vacationing in general and just plain resting.

The business man looks to ways and means of making his business more efficient—outdoor lighting increases—new outdoor and indoor sport fields require lighting and old ones in many cases want better lighting—there are hundreds of places in factories, stores and warehouses where lighting for shelving is required.

The list of prospects for modern lighting grows—many of these prospects can be your customers—and QUAD can help you turn them into customers because QUAD has the line of Industrial, Sign and Flood-Lighting Units that do the right kind of an illuminating job.

If you have't our catalog, we suggest that you write for it now. We are ready to work with you on any lighting problems or consult with our men in the field.

Sincerely

D. E. Worrell

Geo. Arras

Ray Gallaher

QUADRANGLE MFG. CO.

32 S. PEORIA ST.

CHICAGO 7, ILL.

HERE'S A
REPLACEMENT MARKET
YOU SHOULD SUPPLY
WITH

Acme  Electric

FLUORESCENT LAMP BALLASTS

There are "dark spots" showing up in some of those magnificent lighting installations made during war time shortages, when it was impossible to supply even a small percentage of Acme Electric Ballasts in demand. Many fluorescent fixture manufacturers were forced to use substandard ballasts which are burning out.

Any good fluorescent fixture can be made to provide better than ever illumination, by replacing the burned out ballast with an Acme Electric engineered ballast of the capacity required. Acme Electric engineering and construction features are positive assurance of long, trouble-free service.

- | | | |
|---|--|--|
| 1. Provide full rated watt output. | 4. Rated light output. | 7. Cores of annealed silicon steel. |
| 2. Uniform current output—no undesirable peak currents. | 5. Longer lamp life. | 8. Hand finished coils thoroly impregnated. |
| 3. No noticeable stroboscopic effect. | 6. Hum-free — decibel rating below threshold of hearing. | 9. Each ballast is completely sealed in heat dissipating compound. |

ACME ELECTRIC CORPORATION
369 Walter Street Cuba, N. Y.



Acme Electric manufactures Luminous Tube Transformers—Fluorescent Lamp Ballasts—Cold Cathode Lighting Transformers and Ballasts—Mercury Vapor Lighting Transformers — Radio and Television Transformers — Electronic Transformers—Door Bell, Chime and Signalling Transformers—Safety Transformers—Voltage Regulating Transformers—Step Down Transformers — Control Transformers — Warp-stop Transformers — Air Cooled Power Transformers—Rectifiers.

IN CANADA: ACME ELECTRIC (CANADA) LTD.
824 Notre Dame St., West Montreal, Que.



HIXON ELECTRIC INSTALLS 20,000 SYLVANIA TROFFERS IN NEW ENGLAND'S TALLEST BUILDING

Hixon Electric Company of Boston is installing approximately 20,000 Sylvania Fluorescent Troffer Fixtures in the big, new, 26-story Hancock Mutual Life Insurance Co. building in Boston, Mass.

Probably the largest fluorescent troffer lighting job in the world, this Sylvania installation consists mainly of 8-foot shielded troffers, though some 4-foot units are included. Sylvania fixtures were the choice of the John Hancock planning board after an extensive series of studies and tests conducted with actual installations of fixtures submitted by most of the leading manufacturers in the industry.

The fixture shown at the left is the Sylvania 340 troffer (three 40-watt lamps) with the glass shielding lowered for lamp installation. This unit is available with either one or two lamps, glass shielding as well.



SYLVANIA

FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS

... MODERN!

Sylvania recessed troffers are the answer to today's demand for volumes of glare-free light from ceilings uncluttered by exterior types of lighting equipment. Write for full details of Sylvania's exclusive one-year guarantee covering complete fixtures, including lamps, ballasts, starters, and lamp-holders.

... ECONOMICAL!

Designed for low-cost installation and economy of maintenance, Sylvania Troffers deliver a maximum of light at a minimum of expense.

A toggle bolt arrangement permits the weight of the chassis to be carried by the hanger strap during installation, greatly reducing installation time and labor.



Sylvania Fluorescent Troffers are trouble-free fixtures perfectly engineered, ruggedly built of heavy gauge steel, giving unobstructed vision in modern low ceilings... the easiest fixtures to install and maintain! They can be mounted either singly or in continuous rows, and can be fitted to any type of ceiling, new or

old, acoustical tile, lath or plaster. They're shipped complete, ready for installation — with no extra parts to buy. Unshielded fixtures can be easily converted to louver or glass shielded, if desired, after installation. Write for descriptive troffer booklet. Sylvania Electric Products Inc., Fixture Division, Ipswich, Mass.

RAM & FERGUSON — ARCHITECTS AND ENGINEERS
TURNER CONSTRUCTION COMPANY — BUILDERS

HIXON ELECTRIC CO. — ELECTRICAL CONTRACTORS
GEORGE H. WAHN CO. — ELECTRICAL WHOLESALERS

SYLVANIA ELECTRIC



BULB TUBES; RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES

for better fluorescent lighting



• When you demand and insist on Certified Ballasts in fluorescent lighting fixtures—you're protecting your own best interests—as well as the users'.

Everyone benefits by using Certified Ballasts because they assure . . .

Full lamp life
Quiet operation

Rated light output
Dependable performance for fixture life

Strict specifications control the building of every Certified Ballast—Electrical Testing Laboratories, Inc., an impartial judge, then checks and tests them. You're surer of satisfaction with Certified Ballasts.



CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO



YOUR JOBS WILL MAKE NEWS
WHEN YOU INSTALL

THE
NEW

SEE-MASTER

SERIES

by

GARCY

Here are the new pace setters in commercial lighting... the fixtures whose novel features and streamlined perfection will help to put your installations in the headlines. Your very first glance at a SEE-MASTER... with its interlocked, welded louvers—true and unwavering... and fluted, translucent Polystyrene sides... tells you that here is superb styling and unusually fine quality... the product of superior designing, engineering and workmanship. If you're a contractor, you'll appreciate the unique engineering features that mean fast, one-man installation and the plus quality that assures satisfaction after they're up. If you're a jobber, you'll cheer for the "basic units plus accessories" plan that gives you more sales with lower stock investment. If you're a lighting engineer, you'll be interested in SEE-MASTER'S high light output, low surface brightness and effective shielding. And if you're the user, you'll be delighted with their rare beauty, rugged durability and lower maintenance cost.

You'll find them in our new catalog. Write for a copy.

5 MATCHING LUMINAIRES ... REASONABLY PRICED

FLUORESCENT	5000—For 2-40 Watt lamps.
	5400—For 4-40 Watt lamps
	5410—For 2-100 Watt lamps or 2-85 Watt lamps.
SLIMLINE	SL-5000—For 2-96" lamps.
	5096—For 4-96" lamps.

INDIVIDUAL UNITS OR CONTINUOUS RUNS

1898 - 50 YEARS OF PROGRESS - 1948

BASIC UNITS *plus*
ACCESSORIES *form*
COMPLETE FIXTURES



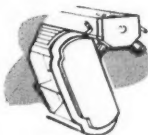
No. 5510
Adda-Strip—a
typical basic
unit.



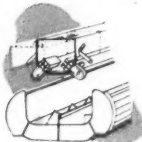
No. 15000
shielding body.



Decorative
end plate.



Shielding body is hinged for immediate access to wireway. Spring type latches provide automatic, positive fastening.



Shielding body easily detached—simply press latches—for safe, down-on-the-floor cleaning.

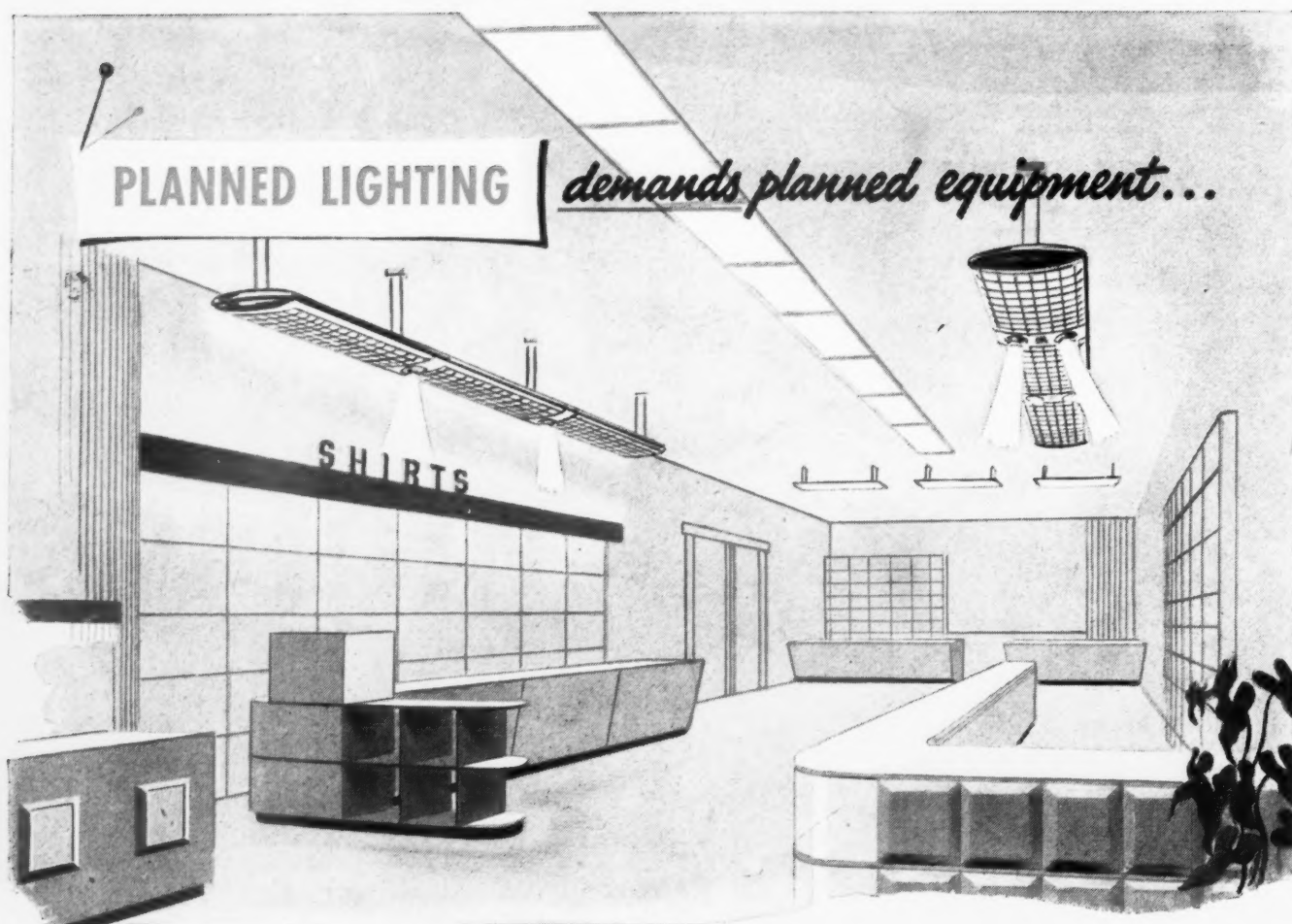


Spot-a-Lite units — beam adjustable to any angle—available for end or mid-run coupling.

GARDEN CITY PLATING & MFG. CO.

1730 N. ASHLAND AVE.

CHICAGO 22, ILL.



which means **FLEUR-O-LIER** fixtures

After you have your Lighting Plan, then comes the question: What lighting fixtures can be *depended upon* to provide the results called for by the Plan?

That's where Fleur-O-Lier fits into Planned Lighting, for since the very beginning of fluorescent lighting, Fleur-O-Lier fixtures have been *planned* lighting equipment. Here's the Fleur-O-Lier plan:

SPECIFICATIONS: rigid requirements devised by the best brains in lighting to insure proper quantity and distribution for ideal lighting performance . . . mechanical and electrical excellence.

TESTING: famous Electrical Testing Laboratories, Inc., examine Fleur-O-Lier units and "certify" as to their conformance to the specifications. This assures you that Fleur-O-Liers are *right* in lighting performance and in construction.

WIDE RANGE OF EQUIPMENT: twenty-five* of the oldest and best-regarded manufacturers make Fleur-O-Lier fixtures. Each must satisfy the high standards of the specifications but originality in design and in construction is not frozen.

Make Fleur-O-Lier equipment a specific part of your Lighting Plan. Then you'll be sure of full lighting performance, of easy maintenance, and of long, trouble-free operation.

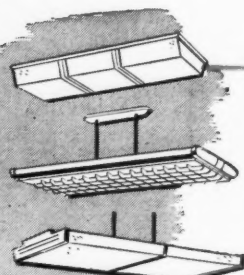
**Participation in Fleur-O-Lier is open to anyone, consequently the number of participants constantly is changing.*

FLEUR-O-LIER

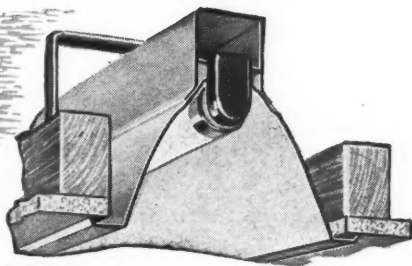
Manufacturers

2116 Keith Building • Cleveland 15, Ohio

Fleur-O-Lier is not the name of an individual manufacturer, but of a group of fixtures made by leading manufacturers. Participation in the Fleur-O-Lier program is open to any manufacturer who complies with Fleur-O-Lier requirements.



WHEN YOU TALK ABOUT
PLANNED LIGHTING . . .
TALK ABOUT . . .



Curtis

EYE-COMFORT

TROFFERS



Illustrated above is a partial view of one of the many departments in the First National Bank of Chicago, showing its installation of A B C Lighting. Approximately five miles of Curtis "Eye-Comfort" Troffers have been installed, providing over 50 footcandles of glareless illumination on the working plane.

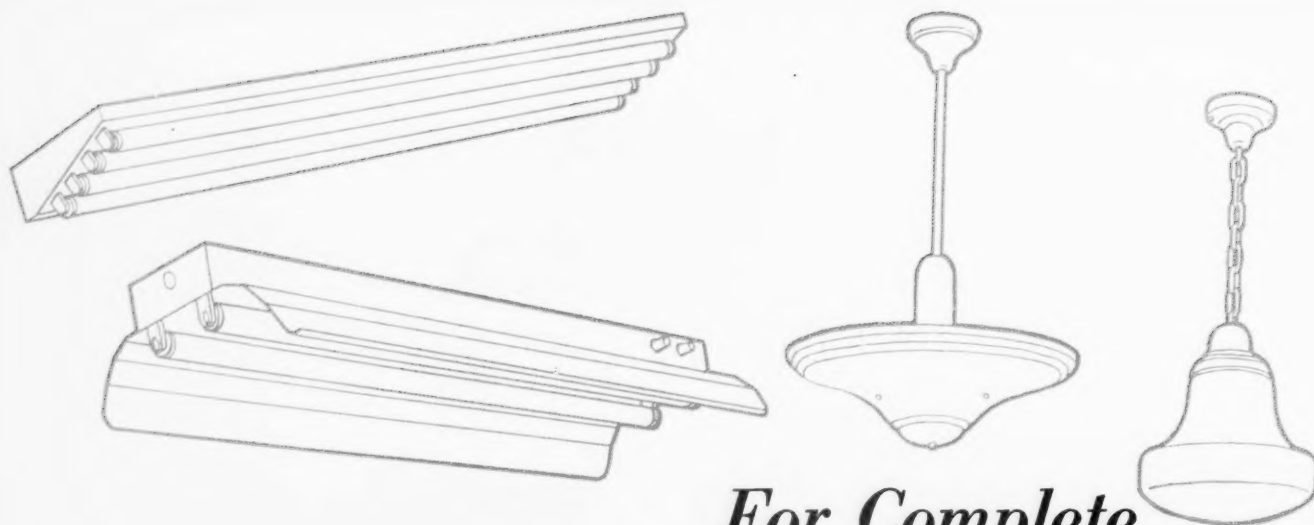
Curtis "Eye-Comfort" Alazak Aluminum Troffers . . . easily installed and maintained . . . utilize the new 40 watt, T-17, 60-inch low-brightness lamp. The reflector contour approximates a parabola and is designed to direct a maximum amount of light to the working plane but limits the amount delivered to the eye . . . true A B C Lighting.

Appropriate Brightness Control, the big feature in modern lighting. The Key? . . . the luminaire . . . the CHARACTERISTICS? . . . high light utilization with low unit brightness. PLUS the relationship of the chromatic values of room contents. Write Curtis for further details . . . for easier sales.



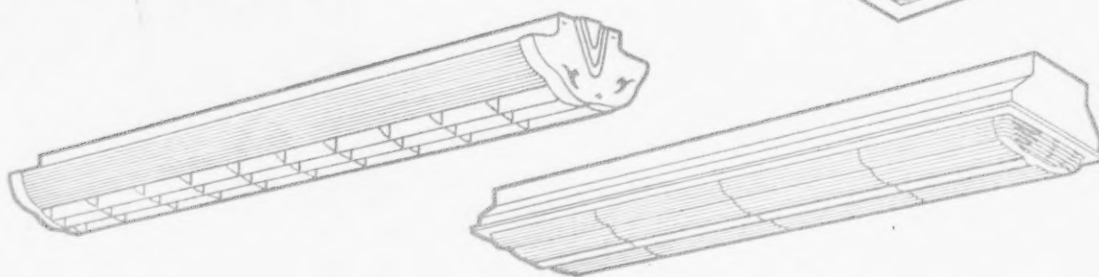
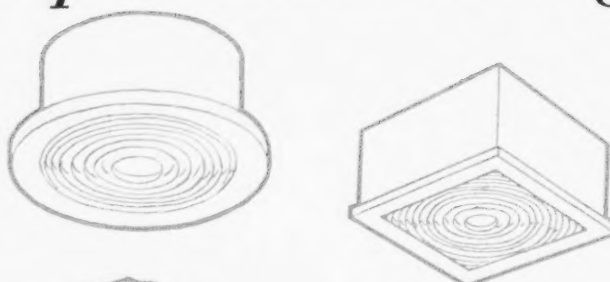
CURTIS LIGHTING, INC.

6135 WEST 65th STREET, CHICAGO 38, ILLINOIS
CHICAGO . . . TORONTO . . . NEW YORK



*For Complete
Cooperation in Selling*

"PLANNED LIGHTING"



Separate catalogs, illustrating KAY-LINE Commercial, Industrial and Home Lighting Fixtures. Drop us a line, on your company letterhead, indicating which you want. We'll be glad to send one or all three.



For Over 55 Years . . .

KAYLINE

KAYLINE

COMMERCIAL

Fixtures, both fluorescent and incandescent, in a wide variety of styles to "fit" with any architecture. Supplied for flush or drop mounting, unit or continuous runs.

INDUSTRIAL

Durably built, KAYLINE Industrial Fixtures are available singly or for multiple mounting, chain or rod suspension. Practical construction for easy mounting and service.

HOME

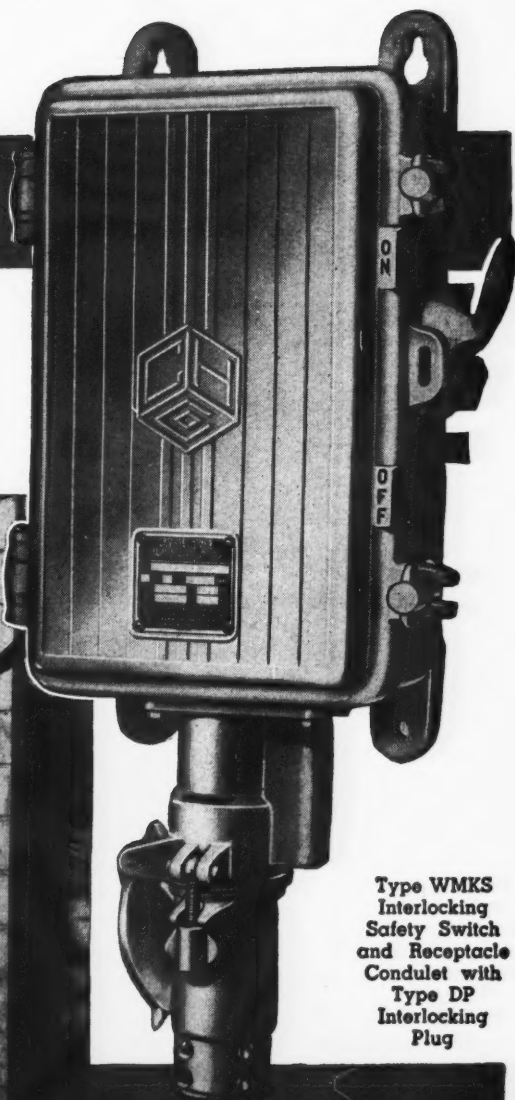
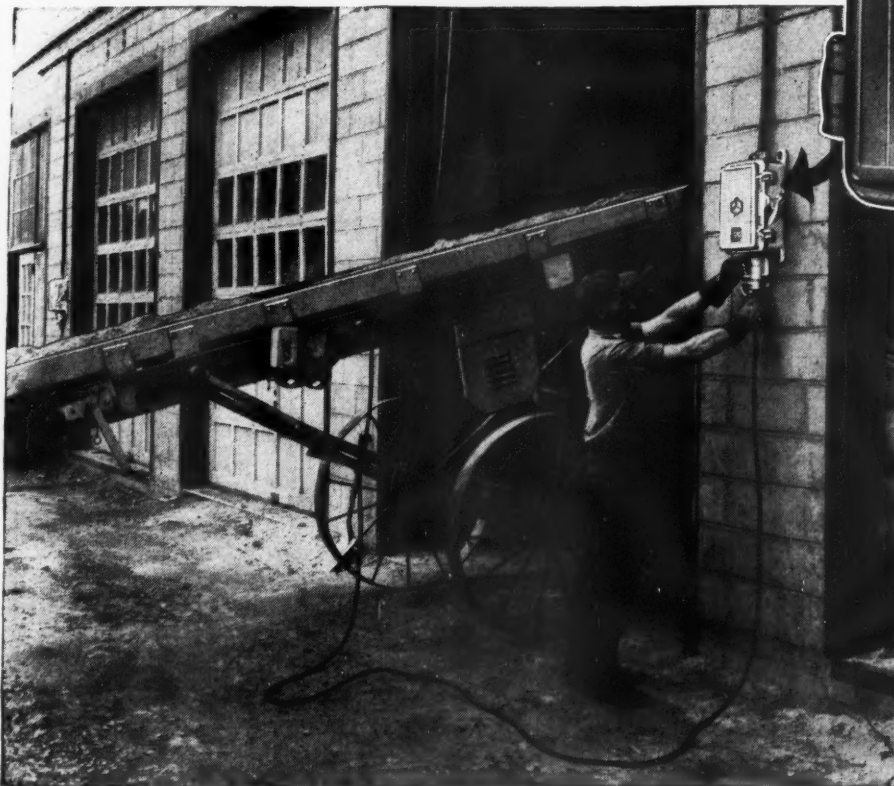
A variety of modern lighting fixtures for low cost homes . . . latest treatments, modern lighting for every room in price ranges to meet all requirements.

The KAYLINE COMPANY
2480 East 22nd Street, Cleveland, Ohio

Type WMKS **Interlocking** Safety Switch and Plug Receptacle

CONDULET *

for the control of all kinds of
portable electrical equipment
in both indoor and outdoor locations



Type WMKS
Interlocking
Safety Switch
and Receptacle
Condulet with
Type DP
Interlocking
Plug

It's heavy duty!
It's raintight!

Safety. Positive interlock prevents opening the case or withdrawing the plug unless the switch is "off". Switch can't be turned "on" unless the case is closed and the plug fully inserted.

Switches. Motor circuit switch. Quick make and break. Double break, reinforced, positive pressure-type blade and jaw construction. Positive pressure fuse clips. Combination solder or solderless wire lugs. 2 or 3-pole fusible.

Plug Receptacles. Style 1 is grounded through the shell of the plug and the receptacle housing. It will take the plugs used with the former Type MKS of the same rating. Style 2 is grounded through an extra pole and the shell. An eyebolt and wingnut prevents accidental withdrawal of the plug when the switch is open.

Cast metal case. Strong and durable. Four sturdy mounting feet. Many possible threaded hub arrangements for both vertical and horizontal conduit. Cover may be padlocked to prevent unauthorized entry. Operating handle may be padlocked "on" or "off".

Threaded operating shaft. Bearings permanently lubricated to resist corrosion and prevent the entrance of dust and moisture.

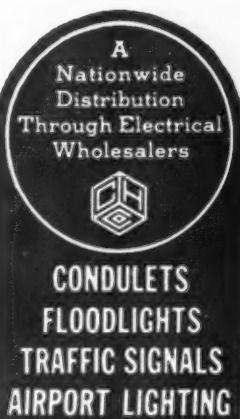
Horse-power ratings. 2 through 50 H. P.
30, 60, 100 or 200-ampere. 230 or 575-volt A. C.

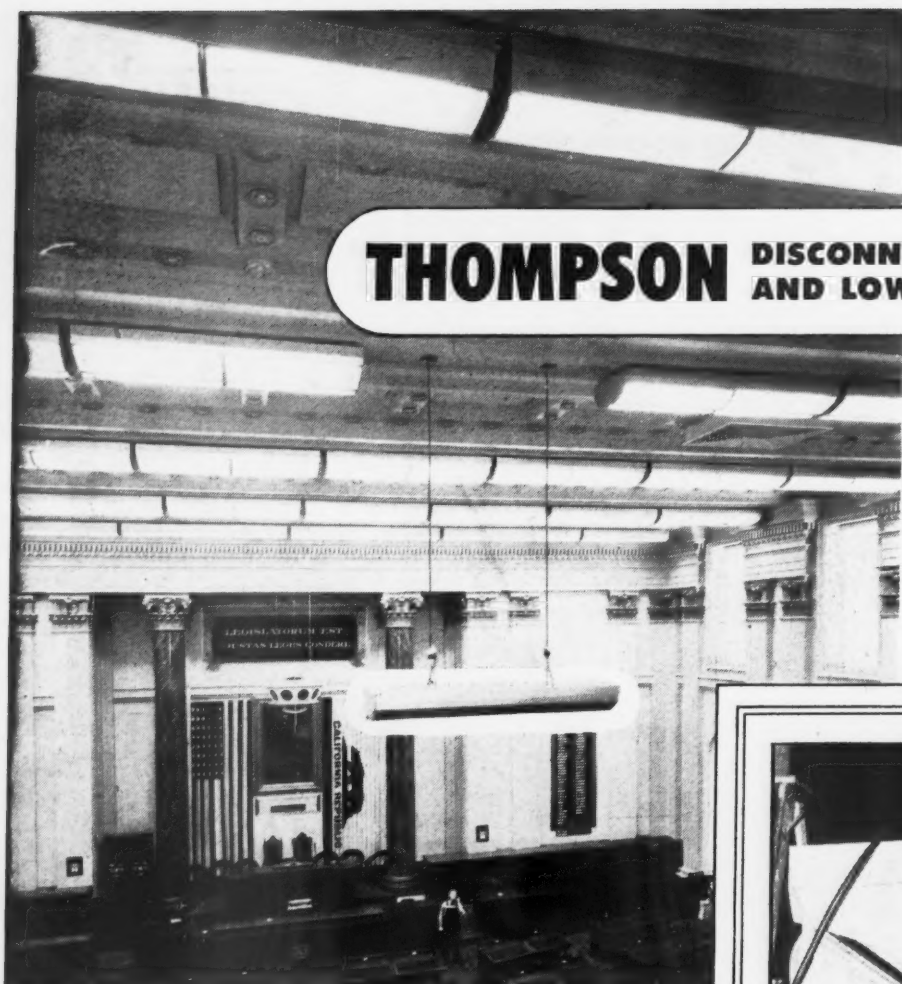
Listed in Condulet Catalog 2500, Section 50.

* CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

CROUSE-HINDS COMPANY Syracuse 1, N. Y.

Offices: Birmingham - Boston - Buffalo - Chicago - Cincinnati - Cleveland - Dallas - Denver - Detroit - Houston - Indianapolis - Kansas City - Los Angeles - Milwaukee - Minneapolis - New York - Philadelphia - Pittsburgh - Portland, Ore. - San Francisco - Seattle - St. Louis - Washington. Resident Representatives: Albany - Atlanta - Charlotte - New Orleans - Richmond, Va. CROUSE-HINDS COMPANY OF CANADA, LTD., Main Office and Plant: TORONTO, ONT.





THOMPSON DISCONNECTING AND LOWERING HANGERS

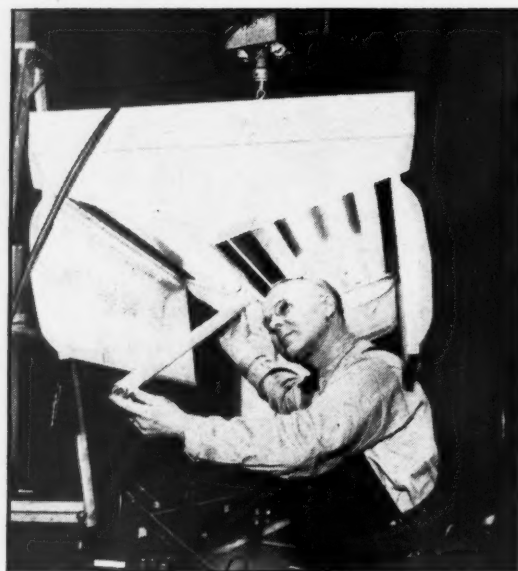
make high bay
**FLUORESCENT
LIGHTING**
feasible

Fixture being lowered

The problem of cleaning and relamping a high bay fluorescent lighting system approximately 33 feet above floor level and containing 382—40 watt 3500° white tubes can only be solved economically with Thompson Disconnecting and Lowering Hangers. That's why they were specified as an integral part of the lighting system in the State Assembly Chamber at Sacramento, Calif. Each fixture is lowered separately to desk top level—electrically "dead". A simple test block arrangement is provided to facilitate final inspection after cleaning and relamping. The 250-pound units are easily winched back to operating position, where they are automatically re-aligned and re-connected into the electrical circuit.

MAKES AIR CONDITIONING PRACTICABLE

The former incandescent lighting system requiring a total connected load of 52,500 watts caused such a temperature rise that when added to normal summer temperature, it made the air conditioning system practically



Fixture being Relamped and Tested

ineffective. The use of fluorescent 40-watt 3500° white tubes provided 40 ft. candles at desk height and the low temperature rise solved the air conditioning problem.

The easy access to lighting fixtures afforded by Thompson Hangers permits frequent cleaning—scheduled relamping—and assures constant foot candles on the desk surfaces to specification.

THOMPSON
DISCONNECTING & LOWERING
HANGERS

We invite you
to use THOMPSON Engineering Service

THE THOMPSON ELECTRIC CO.

1101 POWER AVENUE • CLEVELAND 14, OHIO

LOOK TO ELECTRO... FOR PLANNED LIGHTING

ELECTRO INDUSTRIAL LUMINARIES

Continuous or Individual Mounting

- Open End
- Closed End
- Slimline
- Turret

OPEN

Model B101. Takes 2-40 watt lamps.
An entirely new Industrial Unit
embodying all of the important
engineering developments.

Model B105. (same as above)
takes 3-40 watt lamps.

Model B201. Takes
2-100 watt lamps.

CONTINUOUS

Model B102. Takes 2-40 watt
lamps. 105-inch channel with two
52½-inch reflectors.

Model B106. Takes 6-40 watt lamps.

CLOSED END

Model B104. Takes 2-40 watt lamps.

Model B103. Takes 2-40 watt lamps.

SLIMLINE

Model SL962. Takes 2 96-inch 200
MA lamps.

Model SL963. Takes 2
96-inch 300 MA lamps.

TURRET

Model T124. Takes 2-40 watt lamps
using GE Turret lamp holders.

The New Electro Industrial Line is
complete in every detail. All Models
available in synthetic baked enamel
or porcelain finishes. All fixtures
bear Electro's unconditional guarantee
of satisfaction.

 ELECTRO'S LIGHTING ENGINEERS ARE ALWAYS AT YOUR SERVICE

ELECTRO MANUFACTURING CORPORATION

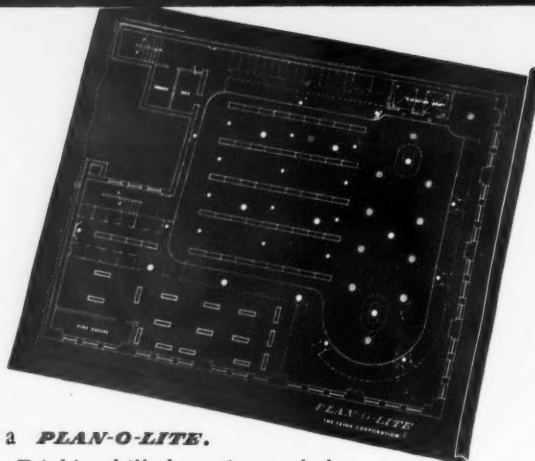


2000 W. Fulton St. • Chicago 12



Men's Clothing Dept., Greenfield's Store, St. Louis, Mo. Five continuous rows of nine fixtures each are recessed in the 11'2" ceiling to produce approximately 40 foot candles maintained. L-I-N-O-L-I-T-E Series 17 two lamp troffers with curved Holophane Controls (17-248) were used for this installation. Architect: Meyer Loomstein.

Ask for a FRINK *PLAN-O-LITE*



... it guarantees lighting satisfaction. If you are planning a lighting installation, take advantage of Frink's unique service. A Frink **PLAN-O-LITE** is an individual lighting layout custom-engineered to your exact requirements. Complete satisfaction is guaranteed, if Frink specifications are followed. There is no extra charge

for a **PLAN-O-LITE**.

Let Frink's skilled engineers help you attain maximum lighting efficiency by proper planning at the start. We will gladly send you a sample packet of **PLAN-O-LITE** layouts and photos of the resulting installations. Mail the coupon today.

CLIP THIS TO YOUR LETTERHEAD



THE FRINK CORPORATION
27-01 Bridge Plaza North, L. I. C., N. Y.
Without cost or obligation, send your sample packet of **PLAN-O-LITE** fluorescent layouts and photos to the

Attention of

() also please send catalogue of new Frink fluorescent fixtures.

9-C

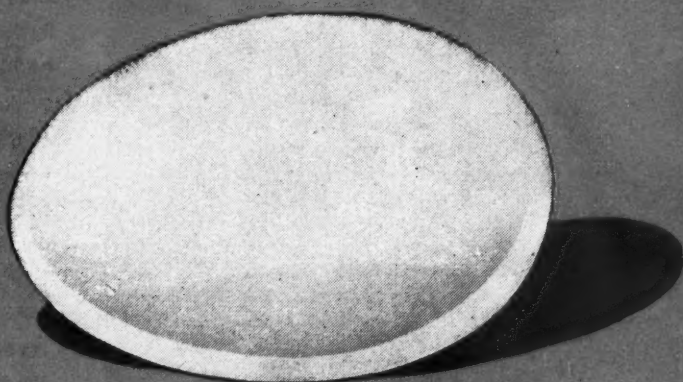
There's a Frink L-I-N-O-L-I-T-E fixture correctly engineered for every commercial fluorescent lighting need. Seventeen standard designs of highest quality workmanship and materials, each available with matching incandescent down-lights if desired. Check coupon at left for your copy of the Frink catalogue today.



THE FRINK CORPORATION

27-01 BRIDGE PLAZA NORTH, LONG ISLAND CITY, N. Y.

LIKE AN EGG



It's What's Inside That Makes The Difference

• The theory of ballast design is well known . . . but the engineering skill and ability — the experience gained through the production of millions of ballasts — the adaptability to *exactly* meet requirements — the control of manufacturing steps — all these determine what you find inside the ballast case.

Inside the case of every Jefferson Electric Ballast you will find incorporated to the highest degree the art of efficient ballast engineering, with all that a generation of specialized experience and manufacturing can provide. Make Jefferson Ballasts your original and replacement specification.

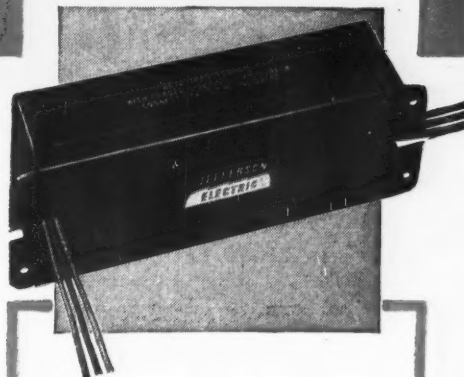
JEFFERSON ELECTRIC COMPANY

Bellwood, Illinois

In Canada: Canadian Jefferson Electric Co., Ltd., 384 Pape Ave., Toronto, Ont.



BALLASTS



Jefferson Ballasts are constructed to give long-life performance with minimum maintenance. All materials used are of a selected high quality determined by the Jefferson Research Laboratory. All raw materials — insulation, copper wire, electrical steel, receive frequent tests to guard and maintain Jefferson standards. In addition, chemical engineers personally supervise all vacuum impregnation, moisture proofing compounds, and heat treatments. These precautions, plus the liberal design and unexcelled workmanship, assure efficient and maximum ballast service.



Top-efficiency surface means

LESS "LOST LIGHT"

Specify Alzak*-Processed Reflectors for floodlighting sports fields, parking areas, and factory yards. You'll be getting the most efficient reflector surface available on standard reflectors.

Alzak Reflectors are easy to keep clean with soap and water. Their all-aluminum shells and reflecting surfaces prevent crazing, breakage, and spalling if dented. They cannot show red rust, are resistant to tarnish.

The leading lighting fixture manufacturers, listed at right, make Alzak Reflectors in all standard styles and sizes. ALUMINUM COMPANY OF AMERICA, 1946 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in 54 leading cities.

*Patented Process

Here's what THE ALZAK PROCESS DOES...

1. Brightens aluminum reflector surfaces electrochemically to produce lighting efficiencies as high as 83%.

2. Seals the bright, high-efficiency reflecting surface with a durable protective coating of transparent aluminum oxide.

This Alzak surface treatment is an *integral* part of the aluminum reflector shell.

The Alzak Process is licensed by Alcoa only to manufacturers of carefully engineered lighting fixtures.

These Manufacturers
are licensed to use
**THE ALZAK
PROCESS FOR
REFLECTORS**

Crouse-Hinds Company

Curtis Lighting, Inc.

Thos. A. Edison, Inc.

General Electric Company

Edwin F. Guth Company

Kleigl Bros., Inc.

Major Equipment Co.

The Miller Company

S & M Lamp Company

Westinghouse Electric
Corporation

ALZAK REFLECTORS

ALCOA ALUMINUM



Wakefield ADVERTISING COVERS:

School • Office • Store Markets — With
4,600,000 Impressions a Year...



The F.W. *Wakefield* Brass Company
Vermilion, Ohio

SIMPLIFY

Guth

RAPID LIGHTING CALCULATOR

Two easy settings give you Foot Candles, Lumens, or Number of Lamps Required—quick answers for your lighting calculations! To get your Calculator free, use the coupon below.

Guth

SPECIFICATION SHEETS

Each Sheet contains Detailed Description and Drawings of a GUTH Luminaire—complete Engineering Factors to make your Light Planning easier. Request a free set of Specification Sheets with coupon below.

YOUR "PLANNED LIGHTING" LAYOUT AND DESIGN WITH THESE PRACTICAL PLANNING TOOLS!



INTENSIFY

Guth

"PLANNED LIGHTING IN ACTION"

Dramatic case histories of Planned Lighting Installations—printed one to a sheet—indexed and punched for easy loose-leaf filing and ready reference. Makes a very useful presentation for selling Planned Lighting. For your free set, use the Coupon below.

Guth

"RAINY NIGHT" FOLDER

A dynamic story that graphically describes the nature and hazards of poor lighting. Available in quantity for distribution to your prospects. For a free sample copy, use the Coupon below.

YOUR "PLANNED LIGHTING" SALES EFFORT WITH THESE POWERFUL SELLING TOOLS!



"PETER PLAN"

The Lighting Man

FOR THE BEST IN LIGHTING
FIRST GET A PLAN FROM THE MAN WHO PLANS



THE EDWIN F. GUTH CO., ST. LOUIS 3

Please send the free Planning and Selling Tools checked below:

- ☐ Rapid Lighting Calculator
- ☐ Set of Specification Sheets
- ☐ Set of "Planned Lighting in Action" Sheets
- ☐ Sample of "Rainy Night" Folder

Name _____
Title _____
Company _____
City _____

This little character conveys the whole idea of Planned Lighting at a glance. We have been using him regularly in our National Advertising, with great success.

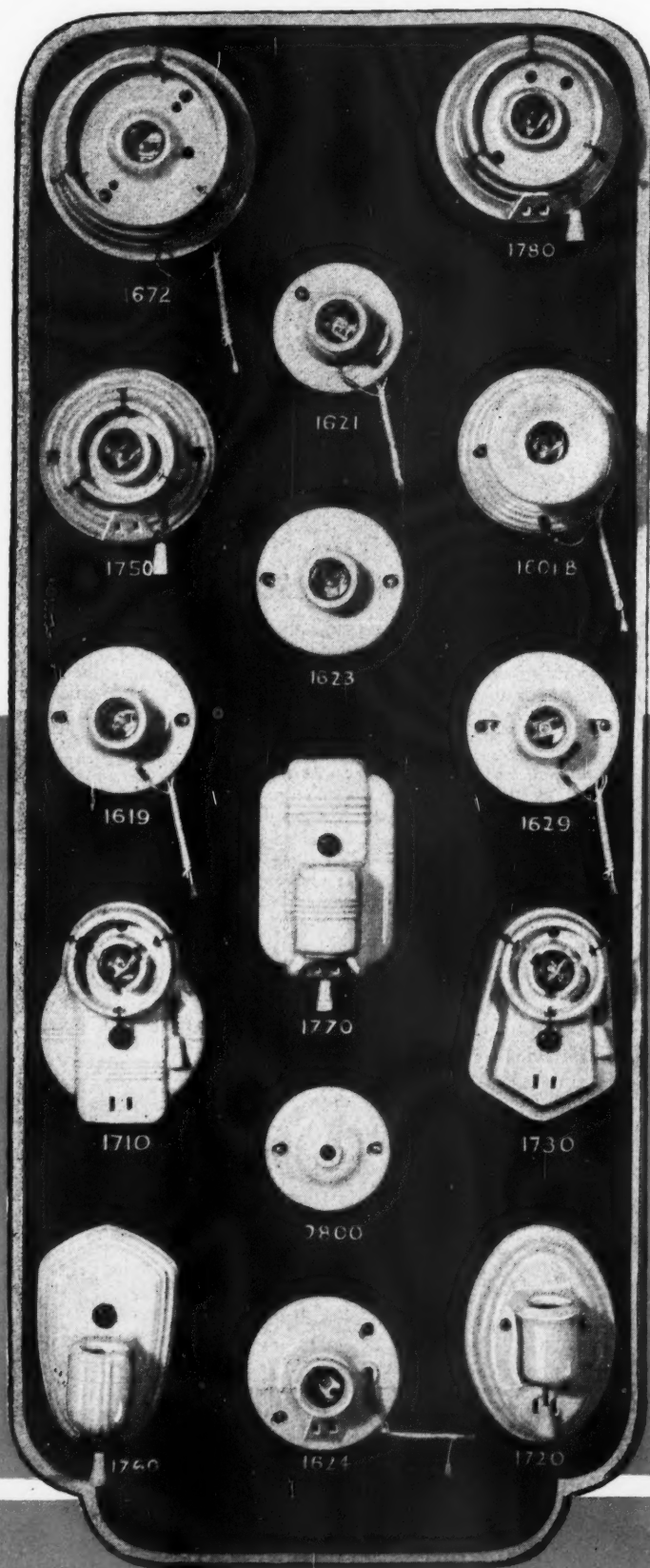
Use it in your own advertising. Electrotypes in 3 sizes are available to you free. Use the Coupon to get your set.

THE EDWIN F. GUTH CO.

ST. LOUIS 3

Leaders in Lighting Since 1902

Paulding KAOLITE *fixtures*



... are made of
the **BEST CAREFULLY
SELECTED MATERIALS**

Our Porcelain is made from
our own formula . . . It is the
BEST INSULATOR KNOWN .

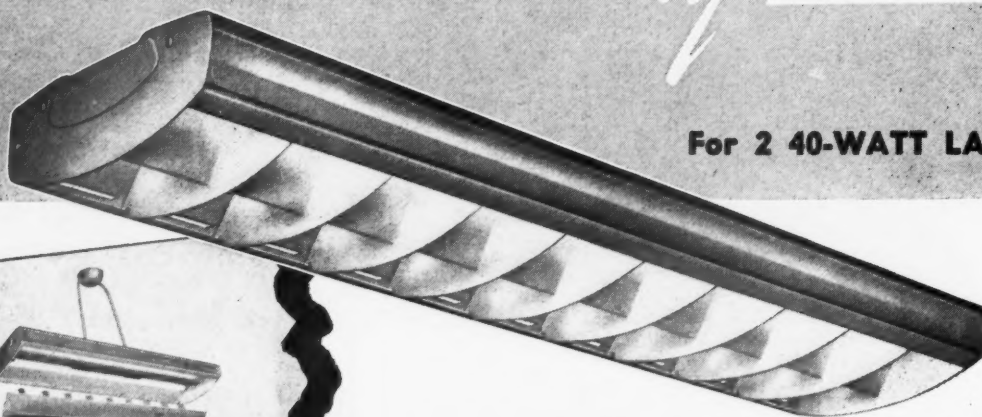
.. It is **EASY TO CLEAN**

NON-CORROSIVE

All mechanisms in the
KAOLITE line are tested
daily . . and each piece
carries an Underwriters'
Laboratories Inc. label for
better service to the
Public . .

J. I. PAULDING, INC.
NEW BEDFORD, MASS.

An OUTSTANDING NEW DEVELOPMENT In LIGHTING DESIGN *EYE-Q by Smithcraft*



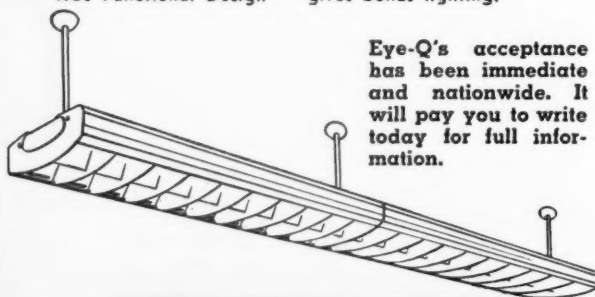
For 2 40-WATT LAMPS

A NATURAL FOR SCHOOLS, STORES, OFFICES AND INSTITUTIONS

Here is the unit that conforms to the highest construction standards — has the exceptionally high lighting efficiency of 83% — yet is unbelievably low in cost! The Smithcraft Eye-Q combines economy, ease of installation, simple maintenance, beauty and efficiency. Never before have so many plus features been combined in one unit — look at just a few:—

- Exceptionally high efficiency of 83%.
- Hinged Removable Louver — opens from either side and is removable without the use of any holding device.
- Guaranteed Ballast — slides along entire unit.
- Versatile Mounting — stems can be inserted at any point on the housing.
- Swiveling Side Reflectors — permits speedy cleaning.
- Lo-Brite Louver Finish — reduces glare, gives cool, comfortable light.
- True Functional Design — gives bonus lighting.

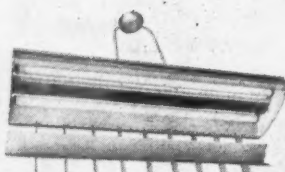
Eye-Q's acceptance has been immediate and nationwide. It will pay you to write today for full information.



Lo-Brite Finish Louvers — minimize glare, open from either side of unit and are positively "snapped" into position without the use of springs, screws or holding device. Louver hangs easily from either side or can be removed completely.



Side reflectors swivel out so that inner reflecting surface may be washed or dusted very simply.



Wide wireway for easy maintenance. Sliding ballast permits use of any type hanging stem at any position along the entire unit—whether mounted individually or in continuous rows.

Smithcraft

LIGHTING DIVISION
CHELSEA 50, MASSACHUSETTS



CERTIFIED STARTERS

deliver best results

IN LAMP LIFE

IN STARTER LIFE

IN MAINTENANCE COSTS

• Those little starters in your fluorescent fixtures are very important to the satisfactory performance of your lighting.

Certified Starters give you best lighting performance because they are made to exacting specifications. Then Electrical Testing Laboratories, Inc., an impartial judge, tests and checks them to assure they conform.

If you want better performance, full lamp life, long starter life and lower maintenance costs, insist on Certified Starters—the ones with the Certified shield on the case and on each starter.

• To be sure you get Certified Starters, look for the Certified shield on the case and on each starter.



Address inquiries to any of the following manufacturers of

Certified Starters

The Arrow-Hart & Hegeman Co., Hartford, Conn.
The Bryant Electric Co., Bridgeport, Conn.
Dura Electric Lamp Co., Newark, N. J.
General Electric Co., Bridgeport, Conn.
Harvey Hubbell, Inc., Bridgeport, Conn.

Instant Glow Starter Corporation, New York, N. Y.

Ironbound Operating Co., Newark 2, N. J.
Kuthe Laboratories, Inc., Newark, N. J.
The Lloyd Products Co., Providence, R. I.
Pass & Seymour Co., Syracuse, N. Y.
Sheldon Electric Co., Irvington, N. J.

No. 1 ESSENTIAL of a good Lighting Plan

LIGHTING EQUIPMENT which complies with these 4 basic specifications

● SUSTAINED LIGHTING EFFICIENCY

The design of the reflector, reflection factor of porcelain enamel, etc., shall be such that the mean light output of the complete unit shall be a maximum percentage of the light generated by the bare lamp (in incandescent units) or of the combined lamp outputs (in fluorescent units).

● QUALITY MATERIALS AND DURABLE CONSTRUCTION

Reflectors shall be made of special reflector steel and of special enameling stock (for fluorescent units: not less than .032 inch in thickness after fabrication; for incandescent units, .019 inch). Reflectors shall be completely covered by fused porcelain enamel, leaving no exposed metal. Total thickness of porcelain enamel on any surface shall not be greater than .025 inch for maximum chip resistance, measurement to be accurate within .001 inch.

● EASE OF MAINTENANCE

Reflectors should be of easy-to-clean quality porcelain enamel which excels in durability, ease of cleaning and low-cost maintenance. This reflecting surface is immune to deterioration, corrosion and weathering, and can be restored to original efficiency by simple soap-and-water cleaning.

● CONTOUR AND SHIELDING

The contour shall be such as to avoid any undue concentration of light beneath the unit. Furthermore, the Shielding Angle shall be such as to provide maximum protection from direct glare from the lamp, consistent with the desired light distribution.

NAME OF MANUFACTURER

COMPLIANCE WITH
SPECIFICATIONS UNDER
APPROVED INSPECTION
PROCEDURE OF RLM STANDARDS
INSTITUTE CERTIFIED BY
ELECTRICAL TESTING
LABORATORIES, INC.



When planning lighting, keep in mind these 4 basic specifications for Good Lighting Equipment. Remember, every time you specify units bearing the RLM LABEL, you are automatically assured strict conformance to EVERY ONE of these standards.

What is "A Good Industrial Lighting Plan?" A Good Lighting Plan is one that provides the right quantity and quality of illumination for the seeing task with a minimum of direct and reflected glare and at the lowest possible "year-in and year-out" operating and maintenance costs.

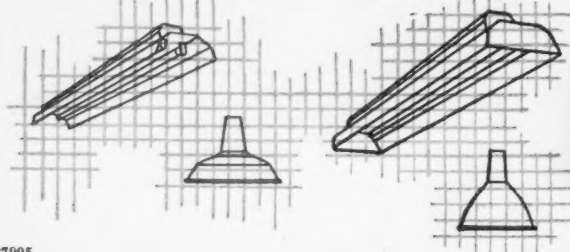
Good Lighting Equipment is Basic to Good Planning. Even with the most careful planning of footcandle levels, light distribution, reflection factors, etc., YOUR LIGHTING PLAN WILL FAIL unless

you insist on lighting equipment which meets the four basic specifications of good lighting equipment.

The RLM LABEL ASSURES YOU continuous compliance with these 4 specifications, as well as 5 other standard specifications. Conformance and uniform quality of each certified unit is determined through strict, periodical inspections by the Electrical Testing Laboratories, Inc., N. Y. Once this organization authorizes affixing of the RLM LABEL to a lighting

unit, the label becomes a warrantee certificate. It guarantees that you can buy, sell, specify or install that unit with complete confidence . . . no need for further checking or verification on your part.

For **Free Booklet** containing standard specifications established for 14 different fluorescent and incandescent lighting units, as well as a list of the manufacturers making them, write to RLM Standards Institute, Suite 819, 326 W. Madison St., Chicago 6, Ill.

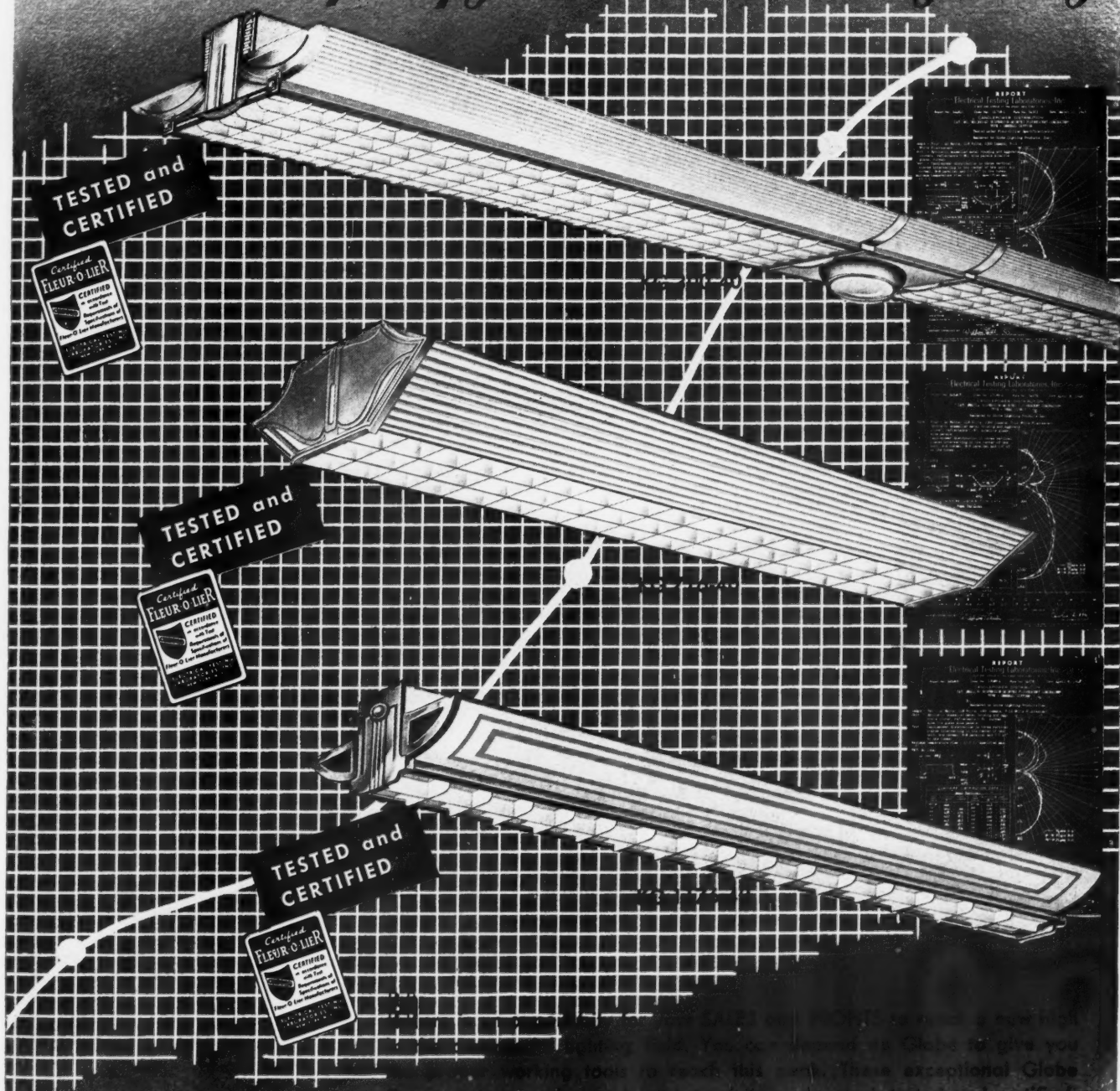


RLM STANDARDS INSTITUTE
INCORPORATED

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

YOUR SALES CURVE GOES UP when you...

Specify **GLOBE** *Lighting*



...working tools to reach this goal. These exceptional Globe fluorescent units in each case have been fully engineered, tested and certified. They have been approved by the Underwriters Laboratories, E.T.L. tested and certified, and Union made. Collectively this means fully satisfied customers and more repeat business. Yes, repeat business that is guaranteed to build up your sales and profits in the months ahead.

GLOBE



WRITE TODAY for GLOBE'S Special Commercial Folder FL-42 showing these new Economizer units and also the colorful RESIDENTIAL Lighting Catalog R-48.

Established for over a quarter century

LIGHTING PRODUCTS INC.
BROOKLYN, NEW YORK • LOS ANGELES, CALIF.
NEW YORK SHOWROOMS • 16 EAST 40TH STREET



It's NEW! It's NEEDED!
It's a
CHAMPION exclusive!

—this R-40
 REFLECTOR FLOOD
 or SPOT LAMP
 with a base
 that *Stays Put!*



Here's what you have been looking for—the useful 150 watt R-40 for all sorts of flood and spot lighting—with a base that *laughs at heat, never lets go, never freezes in the socket, actually improves* instead of deteriorates with age.

Only CHAMPION R-40s have this new, rugged, mechanical, cementless base. Lamp dimensions are unchanged so it fits any or all of the usual recessed fixtures or bullet-shaped holders that so often get too hot for the old style lamp base and result in bulbs pulling loose, falling out or failing long before their time.

This new R-40—available only in lamps bearing the CHAMPION Diamond Mark—is the lamp to use and the lamp to sell. It opens the door to new and profitable volume.

Ask your wholesaler for CHAMPION 150/RFL/M for flood, 150/R/SP/M for spot.

CHAMPION LAMP WORKS

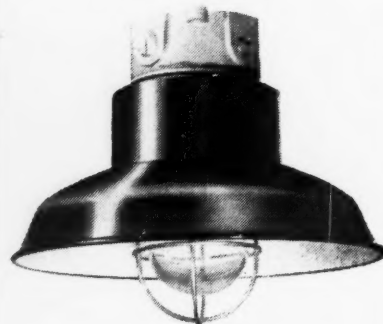
Lynn, Massachusetts

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.



When you plan **BETTER**
VAPORPROOF LIGHTING

Specify **Rab**

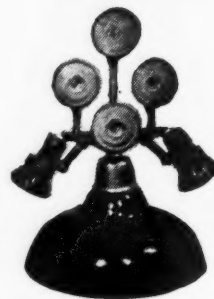


Junction Box Type Vapor Proof
 Fixture With RLM Dome & Guard

- **RUGGED DESIGN**
for bridges, tunnels, dairies,
spray booths, safety zones,
railroad & truck depots, etc.
- **LOW COST**
- **DELIVERY FROM STOCK**
- **U. L. APPROVAL**

When you plan **BETTER**
FLOODLIGHTING

Specify **Rab**



Six Light Assembly For Gas Stations

- **VERSATILE**
one to six light assemblies for
gas stations, parking lots, sign
lighting, cow crossings, dis-
plays, fairs, etc.
- **ENCLOSED WIRING**
- **DELIVERY FROM STOCK**
- **U. L. APPROVAL**

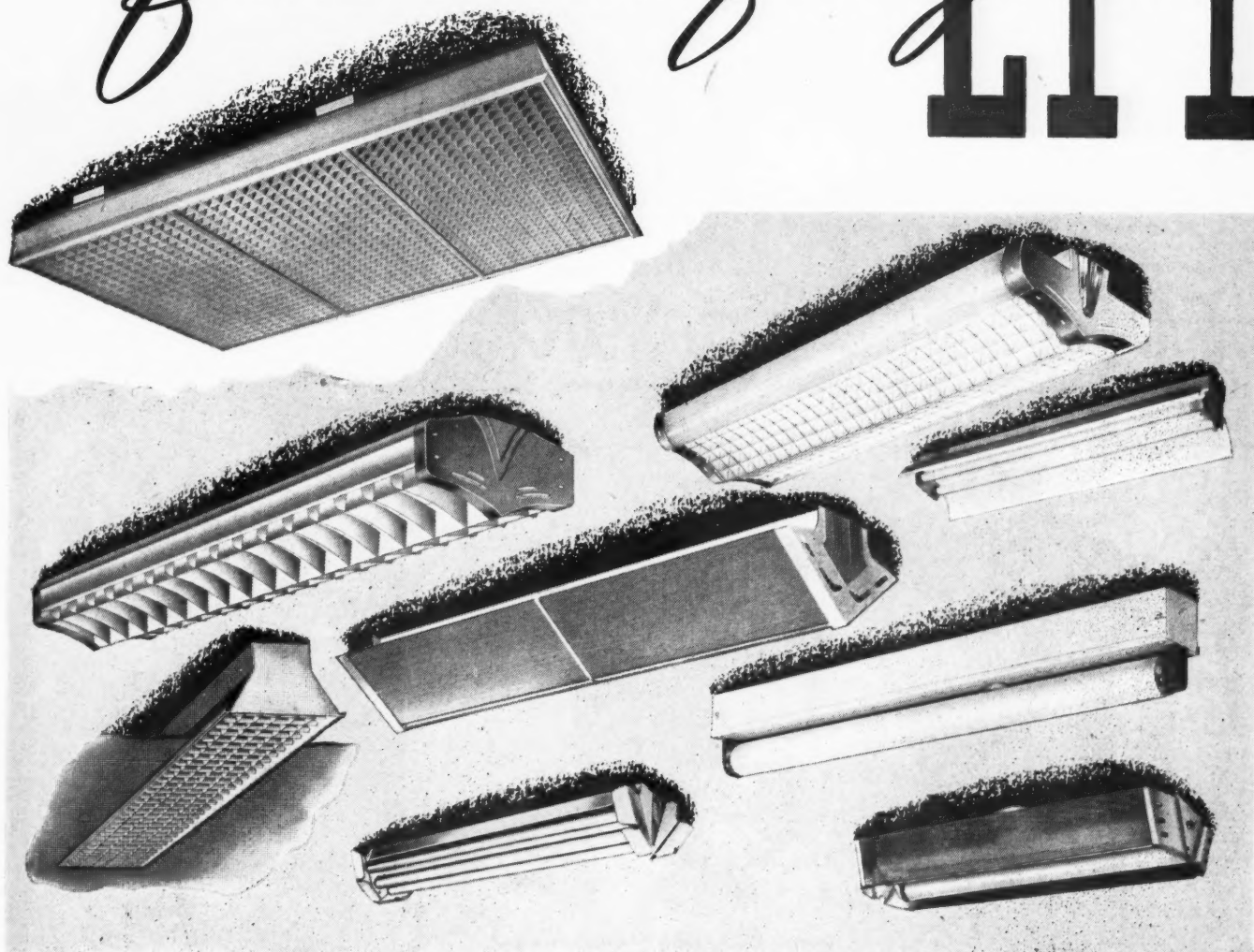
WRITE FOR YOUR CATALOG TODAY

Rab
 ELECTRIC/MFG./CO.

7 EAST 199TH ST., NEW YORK 58, N. Y.

*Foremost in
fluorescent quality*

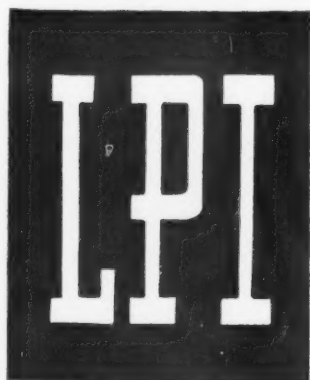
LPI



Easy installation and easy maintenance, correct light cut-off, controlled brightness, and LPI's exclusive "Klasium" white finish are just a few of the special features of *every* LPI Luminaire.

This is leadership based on excellence of design—combining beauty with maximum efficiency. Finest materials, superior workmanship, and loyalty to the best engineering principles enable LPI designers to produce fluorescent fixtures of truly outstanding quality.

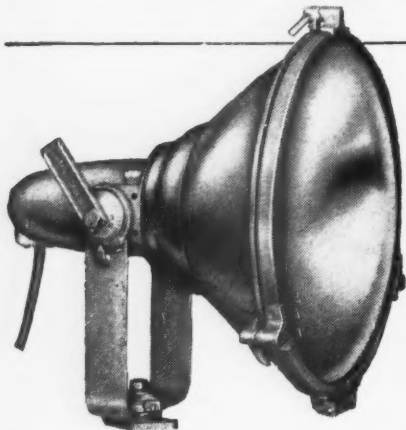
With a variety of styles and sizes from which to choose, any LPI lighting expert can suggest an underwriters approved, union made fixture to serve almost any fluorescent lighting need. Sold nationally through leading electrical wholesalers.



LIGHTING PRODUCTS, INC.
HIGHLAND PARK, ILLINOIS

GENERAL PURPOSE G-E FLOODLIGHTS

available from stock



Type L-82—500 Watts
Type L-83—1000 Watts

For general purpose lighting, Types L-82 and L-83 offer:

Simplified Servicing:

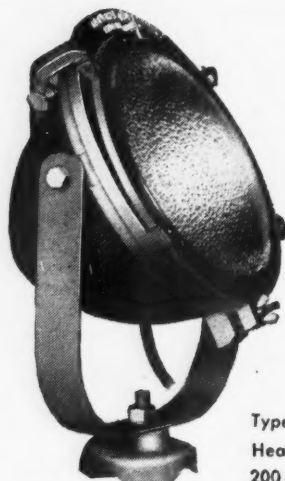
Hinged door saves servicing time. Hand-locking door lugs—no tools needed.

More Light:

New Alzak*-treated aluminum reflector gives higher beam efficiency; more light per watt.

Greater Usefulness:

New portable base is ideal for




Type L-38
Heavy Duty
200-250 Watts

temporary set-ups. Standard base fits all other mountings. Narrow, medium, or wide beam.

HEAVY DUTY, TYPE L-38. Heavy-duty, cast aluminum 200 or 250 watts. Ideal for all rugged services—such as construction equipment.

*Manufactured under Aluminum Company of America patents.

General Electric Agents Stock
The Complete Line of

Floodlights

For more information, phone your nearest G-E agent, or write Apparatus Department, General Electric Company, Schenectady 5, N. Y.

GENERAL  ELECTRIC

461-114

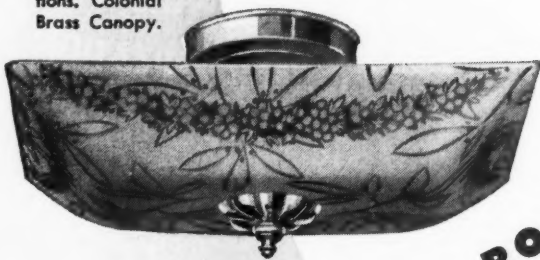
ROYAL



ROYAL FUSES

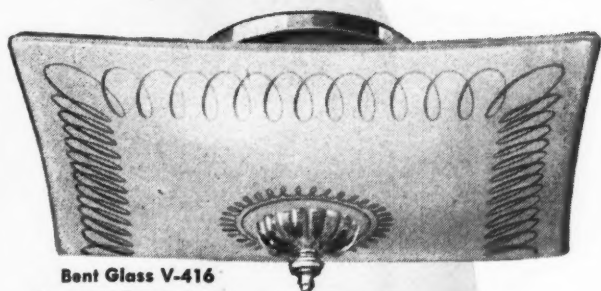
ROYAL ELECTRIC CO., Inc.
PAWTUCKET, RHODE ISLAND

Bent Glass V-414
Spread 14" x 12"
Etched glass with
floral decora-
tions, Colonial
Brass Canopy.



Bent Glass V-3017
Spread 17". Etched glass with
crystal high lights. 2 rows
crystal "U" drops mounted
on Colonial Brass Galleries.

FOR THE LIVING ROOM 4 SMART, NEW FIXTURES *by Virden*



Bent Glass V-416
Spread 16". Etched glass
with crystal high lights.
Colonial Brass Canopy.



Pressed Glass V-716
Spread 16". Pressed glass
bowl with highlighted
scroll design, Ivory canopy.

Here's new loveliness for living rooms, created by tasteful design and artistry in glass. Basically Colonial, these Virden fixtures carry a touch of the modern. They're completely functional from the standpoint of comfortable lighting. And they carry extra appeal for your customers . . . with prices made possible by Virden's mass production planning. Available exclusively from your Virden jobber.



John C. Virden Company • Cleveland, Ohio

Member American Home Lighting Institute

For on-the-spot lighting indoors and out

ABolite reflectors have proven dependable for concentrated lighting in hundreds of applications. Made in approved RLM shapes and others that have the full approval of electrical engineers for efficient and economical lighting.

The complete ABolite line includes many styles and types: deep bowl, shallow bowl, elliptical and symmetrical angle, special flood lights. Fittings are available in threaded neck, separable socket, easy-detachable and special Duo-Move styles.

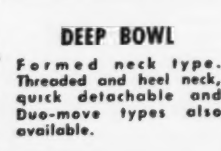


SOLD ONLY THROUGH WHOLESALERS
THE JONES METAL PRODUCTS CO., West Lafayette, Ohio



**RLM STANDARD
DOME**

Separable socket.
Also made in
threaded neck, heel
neck and Duo-move.



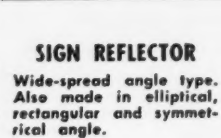
DEEP BOWL

Formed neck type.
Threaded and heel neck,
quick detachable and
Duo-move types also
available.



**OPEN TYPE
FLOODLIGHT**

Elliptical angle. Made
with brackets for either
open or concealed wiring.
Easily adjustable.



SIGN REFLECTOR

Wide-spread angle type.
Also made in elliptical,
rectangular and symmet-
rical angle.



NO. B153

NO. B353

For MAXIMUM LIGHTING EFFICIENCY STONCO

FLOODLIGHTS

WEATHERPROOF

CAST ALUMINUM

NO. B153—3 light assembly shown
mounted on island light
uses PAR 38 lamps.

NO. B 353—3 light assembly uses 300
or 500 watt sealed beam
weather-proof floodlamps.

PREFERRED EVERYWHERE

For Service Stations, Sports Areas,
Industrial, Advertising, etc.

FEATURING the SEALED Beam Type Lamps
(Beam and Light Combined in One Unit—No
Reflectors) Simplicity—Economy—Adaptability
Sold Exclusively Through Wholesalers—Prompt
Deliveries—Write for Catalog.

Stone MANUFACTURING CO.

489 Henry Street
Elizabeth 4, N. J.

FOR NEW WORK FOR MODERNIZATION FOR REPLACEMENTS

Whatever your Wiring Device requirements—you can't go wrong when you install P&S Outlets that hold caps firmly in place—Precision-built switches (with T-rating)—Sockets built for lifetime service.

Keep your P&S Catalog handy—and remember—

The Best Costs Less in the Long Run.

Sold through Electrical Wholesalers

PASS & SEYMOUR INC.
SYRACUSE 9, N. Y.

*Get Acquainted with
the Type S...*



● Type S time

switches are powered by a new Sangamo developed hysteresis type motor that features greater torque... long-life lubrication... low speed—your assurance of better performance.

● They can be easily mounted on a standard switch box or on any wall.

● Two practical colors, brown or ivory, blend with any color scheme.

● Type S time switches are fully approved by Underwriters' Laboratories.

Sangamo Type S Time Switches are available for immediate delivery at your supplier.

LIST PRICE

\$12.45 (Trade Discounts Apply)

Available in Brown or Ivory cases. Type S has one "on" and one "off" operation; Type SR has two "on" and two "off" operations. Ivory case and Type SR are priced slightly higher.

Sangamo also manufactures a complete line of heavy duty time switches, incorporating many control features.

There's Plus Profit in Sangamo *Type S* **TIME SWITCHES**

**SINGLE POLE
SINGLE THROW
Rated 15 Amp.**



These smooth-operating, accurate, precision-built automatic servants open a new field of time switch applications. Their unusually small size, high quality and low price permit the convenience of automatic control in many installations where cost was formerly a prohibitive factor.

Examine the Sangamo Type S Time Switch—compare it with any other moderately priced switch—its exacting workmanship will surprise you, and its attractive appearance will suggest many new "upstairs" installations,

Bulletin 1050A gives the full story—your copy is waiting.



SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

ST4813

MULTI

INDUSTRIAL

LIGHTING EQUIPMENT

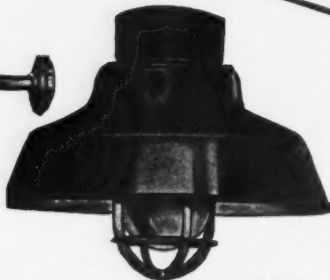
Modern units for
every need..



STEEL REFLECTORS
Porcelain enamel



OUTDOOR
BRACKET FIXTURES
Low-cost unit for utility
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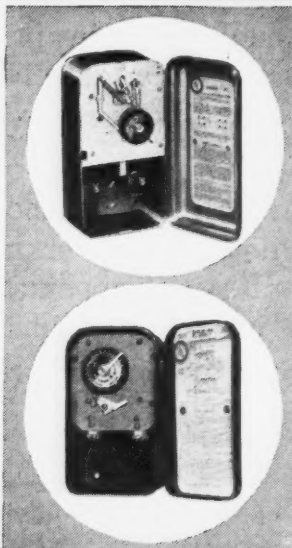
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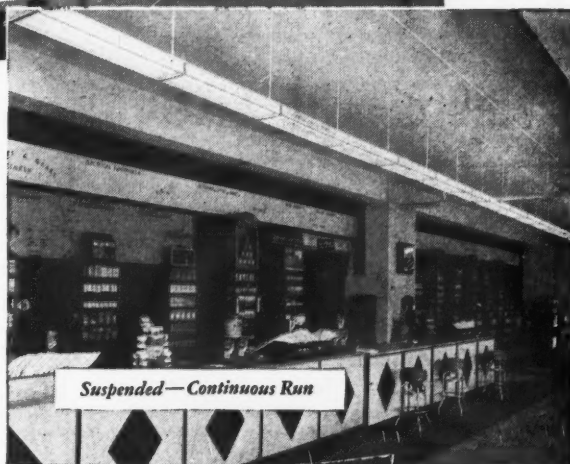


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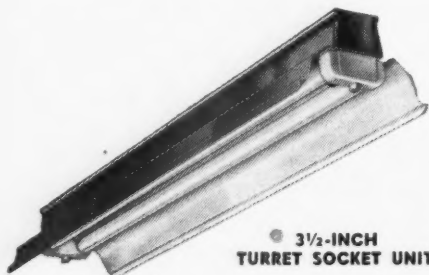
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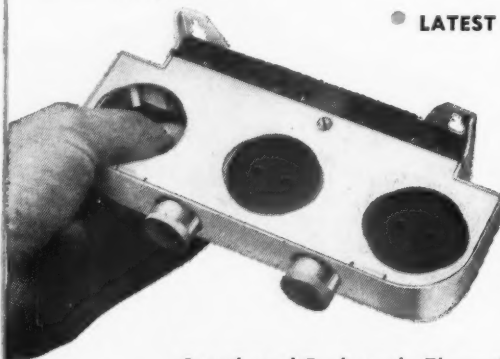
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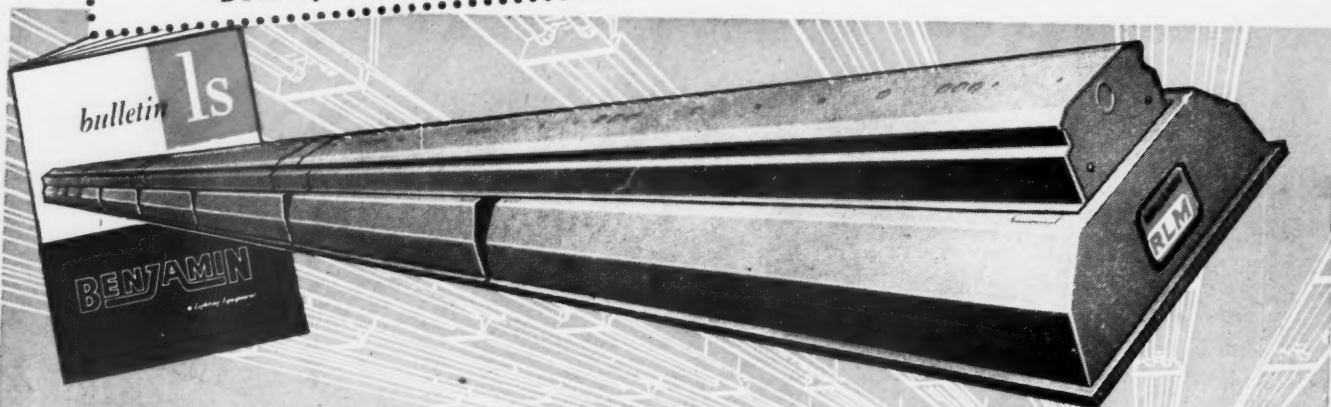
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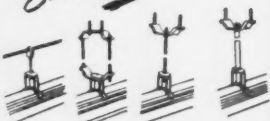
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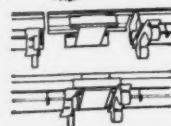
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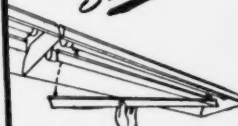
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Oil Field Power Distribution—Part II

A discussion on planning, including cost data.

FOR estimating purposes only, various cost data are listed. They are believed to be sufficiently accurate to arrive at an approximate total installed cost of a power-distribution system. These data are for material, equipment, and labor for the period 1944-1945, for construction in the southwestern area during summer weather conditions, including a percentage for overhead. To adjust labor costs for other areas and periods, assume the labor content as one-third of the total. Labor rates for all areas in the country and a labor index for various years can be found in the "Construction Costs" issue of *Engineering News-Record*.

These data will permit quick cost comparisons of various alternative layouts and are useful at arriving at the most economical layout. Then, accurate costs can be compiled for the selected arrangement.

For final construction costs for budget purposes enlist the services of a reliable oil-field contractor.

If the cost of electrification seems too high, enlist the services of a reliable oil field contractor for a preliminary survey and check. This may be worth many times the cost of the service, especially now with a fluctuating labor market. The contractor knows about grading of conductor sizes, the type of conductor to use, and the best pole spacing for the particular terrain. *The real saving and possibility of reduction in cost of electrification is in the distribution system.*

The total cost of the distribution system will be based on the following component parts for the cost data given in the tables:

- 1) Pole types
- 2) Conductors, including stringing and sagging

By W. C. Bloomquist
Industrial Power Division
General Electric Co.
Schenectady, N. Y.

- 3) Transformer substations
- 4) Capacitor equipment, if used
- 5) Add 10 percent to the above total. This takes care of such miscellaneous items as surveying for the distribution lines, trucking, and other items incidental to installation.

Pole Costs. A few of the most common types of pole arrangements are shown in Figs. 4, 5, 6, and 7. It is only necessary to use the cost of these

four basic pole types to arrive at the total cost, even though other types of pole construction actually will be used in an installation. The cost of guying, anchoring, dead ends, laterals, etc., have been factored into these costs. Digging costs include an average for holes dug in both dirt and rock.

The cost of the "M" pole includes mounting the motor starter, connecting line wire, etc., from the secondary "S" pole, suitable cable or conduit from the top of the pole to the starter, and underground cable from the motor starter to the motor. The cost of an "M" pole should be included for every motor, even though the "M" pole may

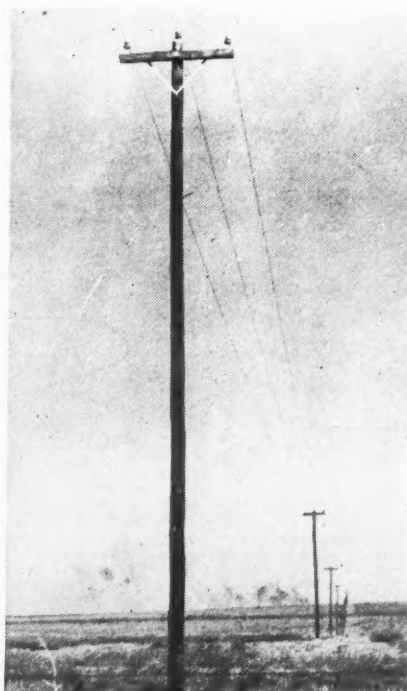


FIG. 4—Typical 2300-volt primary (P) pole, showing line construction for primary feeders.

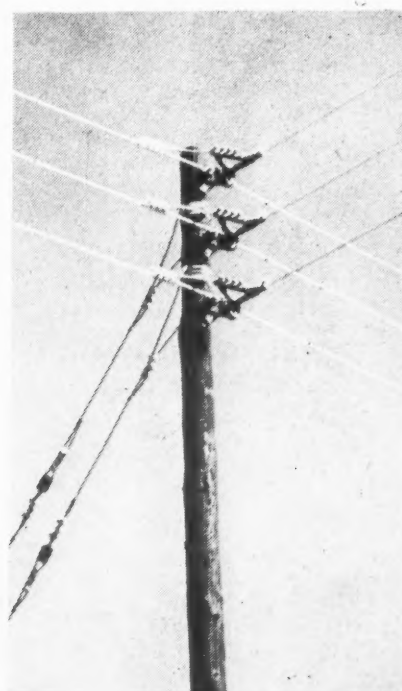


FIG. 5—Typical secondary (S) pole and line construction for 440-volt feeders.

not be used at every location in the actual installation.

Transformer Substations. There is a variety of substation arrangements and designs depending upon personal preference and local rules and practices. Generally, and especially true in the utility industry, transformer banks up to 45 kva. and sometimes up to 75 kva., are pole-mounted on crossarms. Above 45 to 75 kva., a double-pole and platform arrangement is used or else the transformer is located on the ground. Two hundred and twenty-five kva. is a good dividing line in deciding between platform and ground mounting

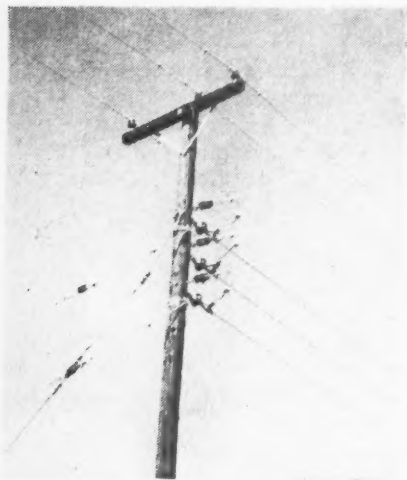


FIG. 6—Pole and line construction when 2300-volt primary (P) and 440-volt secondary (S) feeders are run on same pole.



FIG. 7—Motor (M) pole showing termination of 440-volt overhead feeder and location of motor starter.

of transformers. A typical substation arrangement is shown in Fig. 8.

Because there are so many variations in substation arrangement which may influence the cost, the costs of transformers, cutouts, and lightning arresters are segregated.

Lightning arresters were selected for ungrounded service. Unless the incoming source is solidly grounded at or near the lease, it is doubtful that arresters for grounded service can be applied.

Sometimes it is possible to reduce costs by combining the transformers, motor starter and capacitors in a single substation arrangement, as shown in Fig. 9. In this illustration, it will be noted that there is also a 2300-volt switch-and-plug receptacle box located between the transformers and the motor starter. This outlet box provides primary power for various, large, portable equipments, such as pulling machines. Since power is supplied direct at primary voltage, usually 2300 or 4160 volts, voltage drop is no problem even when large motors are used in the portable equipment. This arrangement for portable equipment is especially attractive when well spacings are small since one outlet can serve several wells.

Table 3 lists the standard ratings of single and three phase distribution-type transformers and also the preferred industry ratings of single-phase units.

Type of Line Conductor. In "sour" gas areas, aluminum ACSR conductors

generally are used instead of copper because of the non-corroding qualities of aluminum.

The spans between poles for 440-volt line construction can be from 300 to 500 feet with aluminum, compared with 150 to 350 feet with copper. Thus, the pole costs for aluminum lines are roughly half that of copper lines, and since pole costs are an appreciable part of the total cost, this represents a large saving.

Whenever possible, advantage should be taken of the natural spacing of wells to obtain the minimum number of poles. For example, with 10-acre well spacing (660 feet), pole spacings

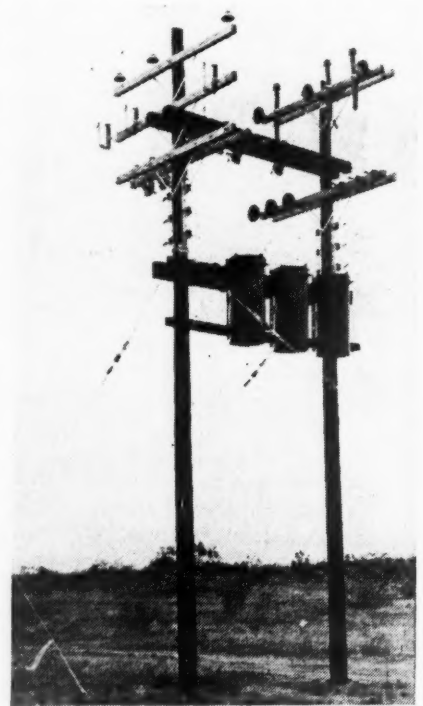


FIG. 8—Substation construction showing three 25-kva. single phase transformers with fused cutouts and lightning arresters.

TABLE 3

STANDARD DISTRIBUTION-TRANSFORMER RATINGS

Standard ratings of single- and three-phase distribution-type transformers, and preferred industry ratings of single-phase units.

Single-phase Units KVA Rating	3 Single-phase Units Bank KVA	1 Three-phase Unit Bank KVA
1.2	4.5	
*3		
*5	15	10
7.5	22.5	15
		25
*10	30	37.5
*15	45	50
*25	75	100
37.5	112.5	200
*50	150	
75	225	
*100	300	
*150	450	
200	600	
*250	750	
*333	1000	
*500	1500	

*These are industry-preferred ratings.

of 330 feet would be desirable. Similarly, with 40-acre well spacing (1320 feet), pole spacings of 330 or 440 feet would be desirable.

For equivalent conductor size, the voltage drop and wire costs are about equal.

Aluminum has the disadvantage that under fault conditions a longer length of line may be destroyed, since it melts more easily than copper. In addition greater care is required to make satisfactory splices and terminations with aluminum.

Use of Estimating Data

Considerable data are included here for handy reference and for quickly estimating the various required voltage drops.

The quick-estimating voltage chart, Fig. 10, will be especially useful in eliminating a large number of tedious calculations otherwise necessary even for preliminary layouts. The unit-load—unit-length principle of voltage-drop calculations is particularly useful. After the most economical distribution layout is selected, then the more accurate, final, long-hand calculations can be made if necessary.

Only one chart, for 440-volt service, is included since the major drop is in the 440-volt distribution system. The

voltage drop in the primary system is small and for estimating purposes may be taken as 1 to 3 percent. Although the chart is based on a representative conductor spacing, the actual spacing may be materially different without greatly affecting the accuracy of the results.

The percent voltage drop is in terms of the voltage at the load; i.e., the receiving-end voltage. For example, if the voltage drop as read from the chart is 10 percent, it means that the voltage at the sending end—e.g., transformer bank—must be 440 times 1.10 or 484 volts. If the receiving-end voltage is not 440 volts then a load multiplier, also given on the chart, should be applied. Since voltage drop or regula-

tion is commonly expressed in terms of the receiving-end voltage, this means some cut-and-try work is necessary. However, for estimating purposes only, the percent regulation on the basis of the known sending-end voltage may be used without too great an error. Thus, if the no-load transformer voltage is 480 volts and the regulation is 15 percent, the approximate receiving-end voltage is $480/1.15$ or 418.

This chart can be used directly when only a single load is connected to a line; when several loads are tapped along the line cut-and-try checks must be made for each line section, starting from the remote load.

Several calculations of typical oil-field layouts having several 440-volt

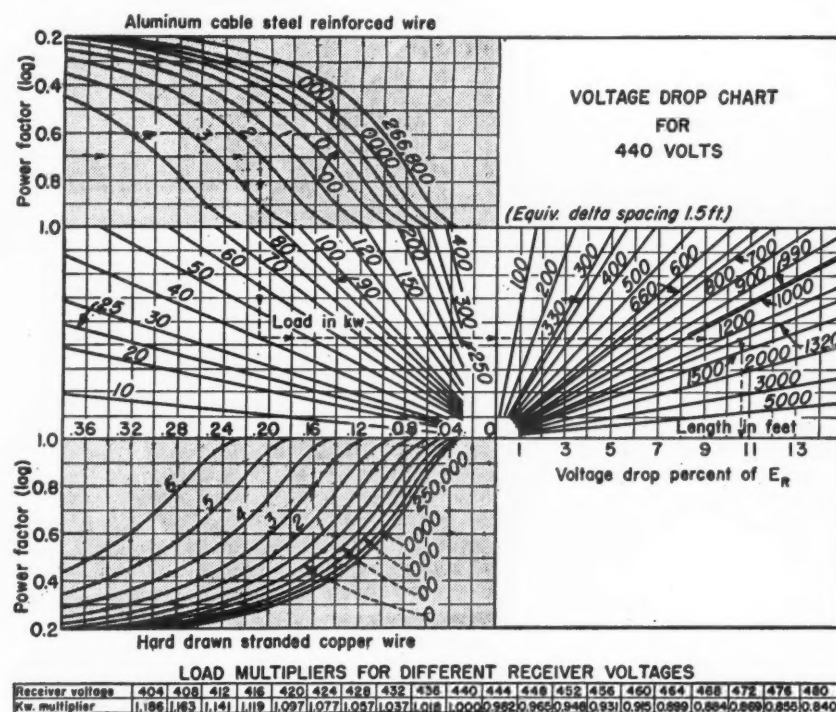


FIG 10—Chart for rapid estimation of voltage drop.

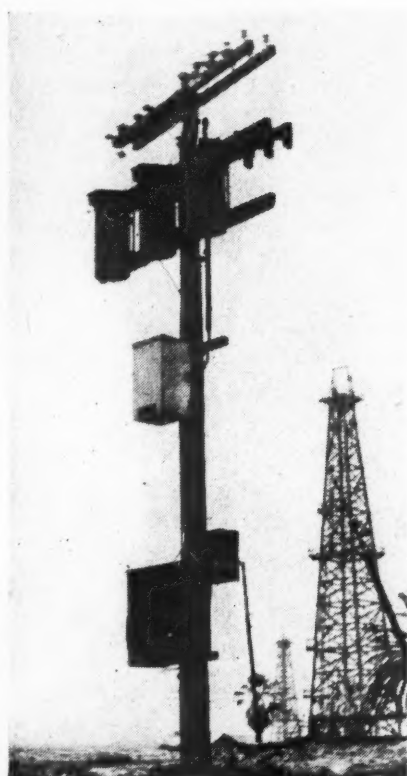


FIG. 9—Installation of several equipments on single pole. From top to bottom; three 15-kva. transformers, two 10-kvar capacitors, and box containing motor starter and fusible switch for plugging in portable mast lights.

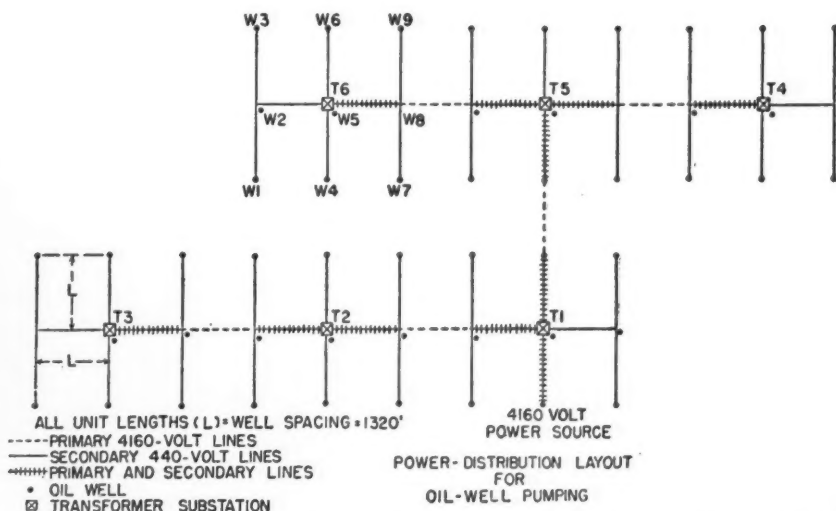


FIG. 11—Typical system layout, indicating wells (W), substations (T), primary and secondary lines.

loads tapped off a 440-volt feeder, such as Fig. 11, showed that if the *voltage drop as read directly from the 440-volt chart* did not exceed 10 percent, the actual minimum voltage at the farthest well location would not be less than 415 volts, which is the minimum operating voltage recommended.

Voltage Drop Due to Motor Starting. The voltage drop due to motor starting should be checked for the final distribution layout to make sure that sufficient voltage is available at remote well locations to start the motor.

The voltage drop in the transformer bank and secondary lines may be read directly from tables and volt-drop chart. The voltage drop in the primary lines usually can be neglected. The following data are representative for motor-starting conditions:

900 to 1200-rpm. Motors

Starting

Type of Motor Power Factor
Normal starting torque. 30 to 50 percent
High starting torque. 35 to 60 percent
Motor Inrush
(Times Full-load Current)

Normal starting torque. 50 to 6.5
High starting torque. 4.5 to 6

The full-load motor kva. will range from 0.95 to 1.05 of the motor horsepower rating, but for estimating purposes it is usually taken as 1 kva. per hp.

Example—What kw. load value should be used in calculating the voltage drop in the 440-volt line due to starting a 15 hp. high-starting-torque motor?

Kva. = 15 (hp) × 5.5 (inrush) × 1.0 (kva/hp) = 82.5

For a starting power factor of 40 percent

$$\text{kw.} = \frac{40}{100} \times 82.5 = 33$$

The voltage drop in the line is read directly from the chart in the regular manner for a load of 33 kw. at a power factor of 40 percent.

When capacitors are used with the motor for power factor improvement, the voltage drop will be less and will be 90 to 95 percent of the voltage drop without capacitors. While the improvement of voltage drop due to capacitors for motor starting is not nearly as large as the improvement for normal load operation, it is helpful and especially so when starting is difficult because the starting torque varies as the voltage squared (V^2).

Unit-load—Unit-length Principle. In the unit-load—unit-length (UL-UL) principle, the voltage drop is calculated for a selected load and conductor length and this value used as a base for other combinations of loads and lengths.

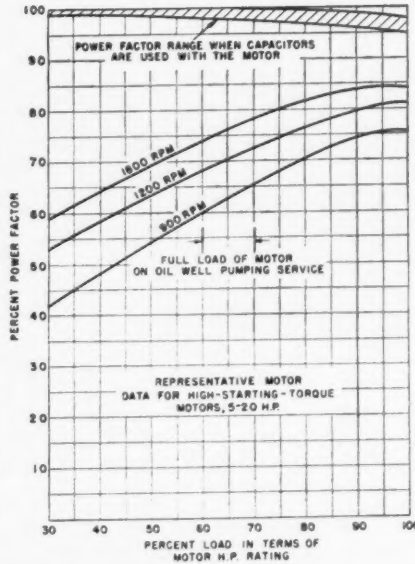


FIG. 12—Percent motor power factor vs. load for high-starting-torque motors 5-20 hp.

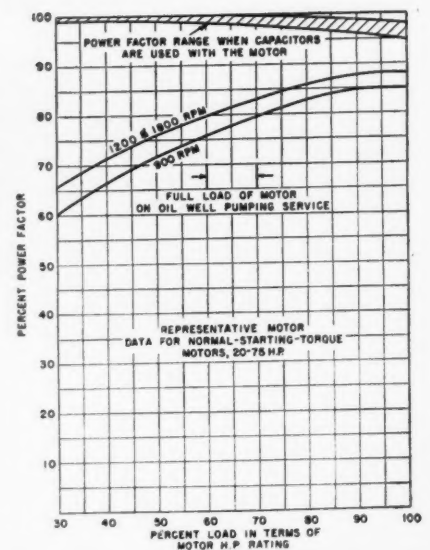


FIG. 13—Percent motor power factor vs. load for normal-starting-torque motors 20-75 hp.

TABLE 4

APPROXIMATE LINE RESISTANCE AND REACTANCE DATA FOR ALUMINUM CONDUCTORS.
Ohms per 1000 Feet at 60 Cycles for Single Conductor

Gage AWG or MCM	Copper Equiv.	Res. in Ohms at 25°C ACSR	Approx. ⁽¹⁾ Current Capacity Amps.	Reactance in Ohms Equivalent Distance (inches) between Conductors ⁽²⁾				
				12"	18"	30"	36"	42"
4	6	0.425	103	0.117	0.126	0.138	0.142	0.146
3	5	0.337	120	0.115	0.124	0.136	0.140	0.144
2	4	0.268	140	0.113	0.122	0.134	0.138	0.142
1	3	0.212	160	0.111	0.121	0.132	0.136	0.140
1/0	2	0.169	186	0.109	0.118	0.130	0.134	0.138
2/0	1	0.136	215	0.107	0.116	0.128	0.132	0.136
3/0	1/0	0.110	250	0.105	0.114	0.126	0.130	0.134
4/0	2/0	0.088	290	0.103	0.112	0.124	0.128	0.132

TABLE 5

APPROXIMATE LINE RESISTANCE AND REACTANCE DATA FOR COPPER CONDUCTORS.
Ohms per 1000 Feet at 60 Cycles for Single Conductor

Gage AWG or MCM	Res. in Ohms at 25°C	Approx. ⁽¹⁾ Current Capacity Amps.	Reactance in Ohms Equivalent Distance (inches) between Conductors ⁽²⁾				
			12"	18"	30"	36"	42"
4	0.266	103	0.114	0.124	0.136	0.140	0.144
3	0.211	120	0.111	0.121	0.133	0.138	0.141
2	0.169	140	0.109	0.118	0.129	0.134	0.137
1	0.132	160	0.106	0.115	0.127	0.131	0.135
1/0	0.105	186	0.103	0.113	0.124	0.129	0.132
2/0	0.0835	215	0.101	0.110	0.122	0.126	0.129
3/0	0.0662	250	0.098	0.108	0.119	0.123	0.127
4/0	0.0525	290	0.0953	0.105	0.116	0.121	0.124

(1) 40°C rise for bare overhead conductor. Current-carrying capacity not an important factor in selecting conductor size for oil-field systems.

(2) For equally spaced conductors mounted horizontally or vertically, the equivalent distance between conductors = actual spacing × 1.26.

The following example will serve to illustrate the use of the unit-load—unit length principle:

- 1) Well layout, according to Fig. 11.
- 2) Well motors, 15-hp., 440-volt, 1200-rpm., high-starting-torque-type.
- 3) All wells pumped simultaneously.
- 4) All motors fully loaded.
- 5) Well spacing, 1320 feet (40 acres) per well.

6) Line conductor, No. 2 ACSR.

7) Substation under consideration, T6, Fig. 11.

The unit length is that corresponding to the well spacing, or 1320 feet. The unit load is that corresponding to the motor load.

The kw. input of a motor, or the unit load, is that corresponding to the average load on the motor, and for a



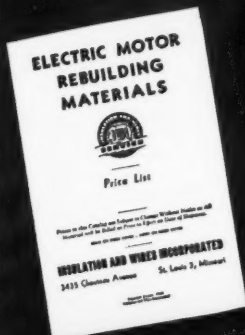
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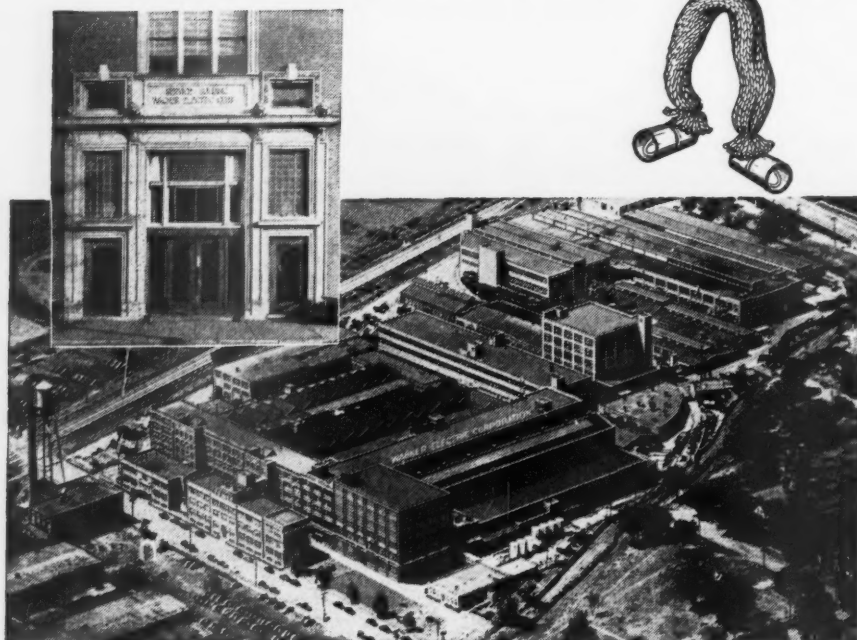
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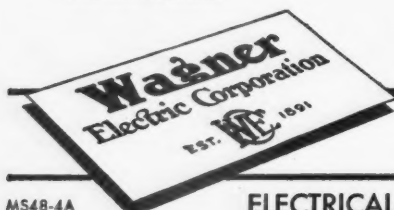
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fully loaded motor for pumping-jack service this average load is 60 to 70 percent of the motor horsepower rating. Therefore, if the motor has been selected correctly, the kw. input may be expressed in terms of the motor rating as follows:

$$\text{Motor hp. rating} \times 0.746 \times \text{loading factor}$$

$$\text{kw. input} = \frac{\text{Efficiency}}{\text{Efficiency}}$$

Assuming a loading factor of 65 percent and an efficiency of 82 percent, then:

$$\text{kw. input} = \frac{15 \times 0.746 \times 0.65}{0.82} = 8.9 \text{ kw.}$$

The load power factor may be read from Figs. 12 or 13. For a loading factor of 65 percent and a 1200 rpm. motor, the power factor as read from Fig. 12 is 70 percent which, when expressed in terms of a decimal is 0.7. (Figs. 12 and 13 also show the resulting power factor when capacitors are used to improve the motor power factor; it should be noted that the resulting power factor is excellent and is practically independent of motor loading, an especially desirable advantage in oil-pumping service).

The voltage drop for a unit load of 8.9 kw. at 0.7 power factor and a unit length of 1320 feet, may be read directly from the 440-volt chart, but not with any degree of accuracy for such a small load. A higher load, 40 kw., was selected. The voltage drop (see chart for construction lines) for 40 kw. is 10.65 percent. The voltage drop for one unit load of 8.9 kw. is:

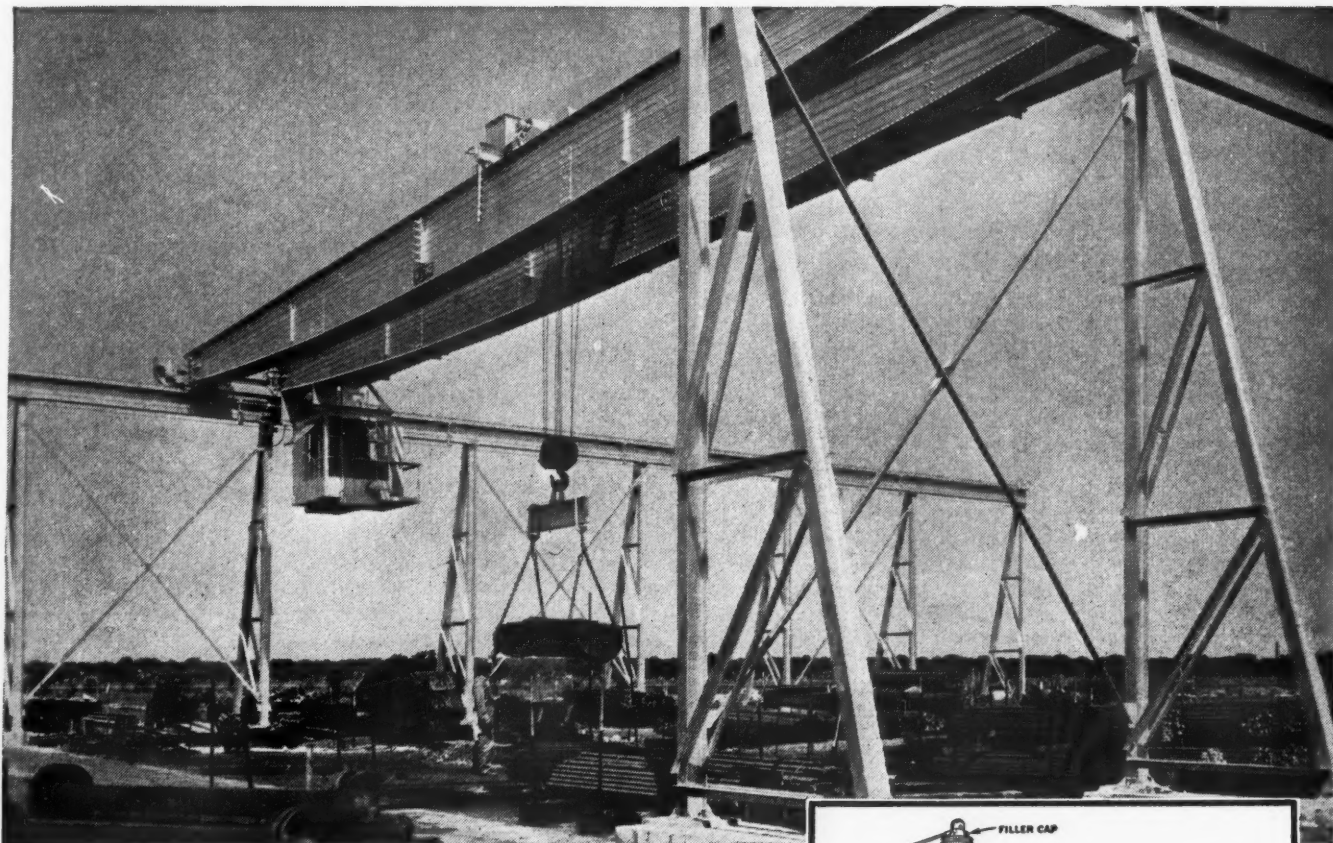
$$\frac{8.9}{40} \times 10.65 \text{ percent} = 2.37, \text{ or say } 2.4 \text{ percent.}$$

The voltage drop for 1 UL-UL is 2.4 percent. The voltage drop for 2 UL-UL is 4.8 percent and may be for 1 unit load and 2 unit lengths or 2 unit loads and 1 unit length. The advantage of this UL-UL principle becomes apparent when many voltage drop calculations are involved.

When motors are not all of the same size and well spacings are not equal, it is best to prepare a master UL-UL voltage-drop table for the various combinations involved; then the drop for a particular UL-UL combination is read directly from the chart.

The UL-UL principle can also be applied to simplify system line-loss calculations. The unit load selected is generally the full-load current of a motor. Allowance must be made for the fact that losses are proportional to the square of the current (I^2). For example, if there are 2 unit loads and 1 unit length, the loss is $(2)^2 \times 1$ or 4 units. The resistance of various conductors sizes are given in Table 4 and 5.

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● A Size and Type for Every Application . .

Wagner hydraulic crane-bridge brakes are built, with or without parking attachment, in four sizes that are capable of handling any application—from light industrial cranes to the largest steel mill ladle crane.

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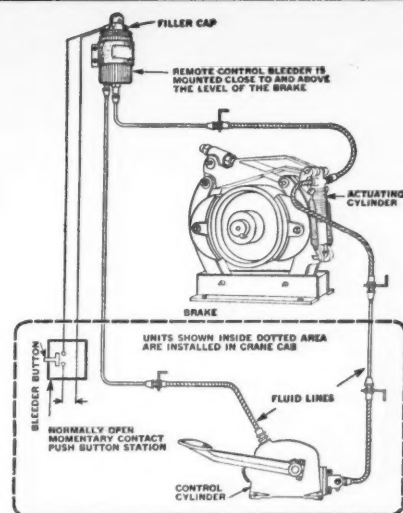
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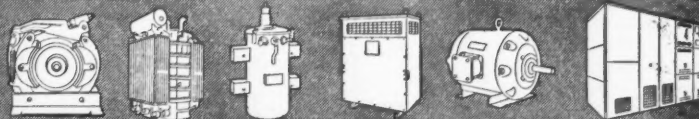
Bulletin IU-40 gives full information on Wagner Industrial Brakes—write for copy.

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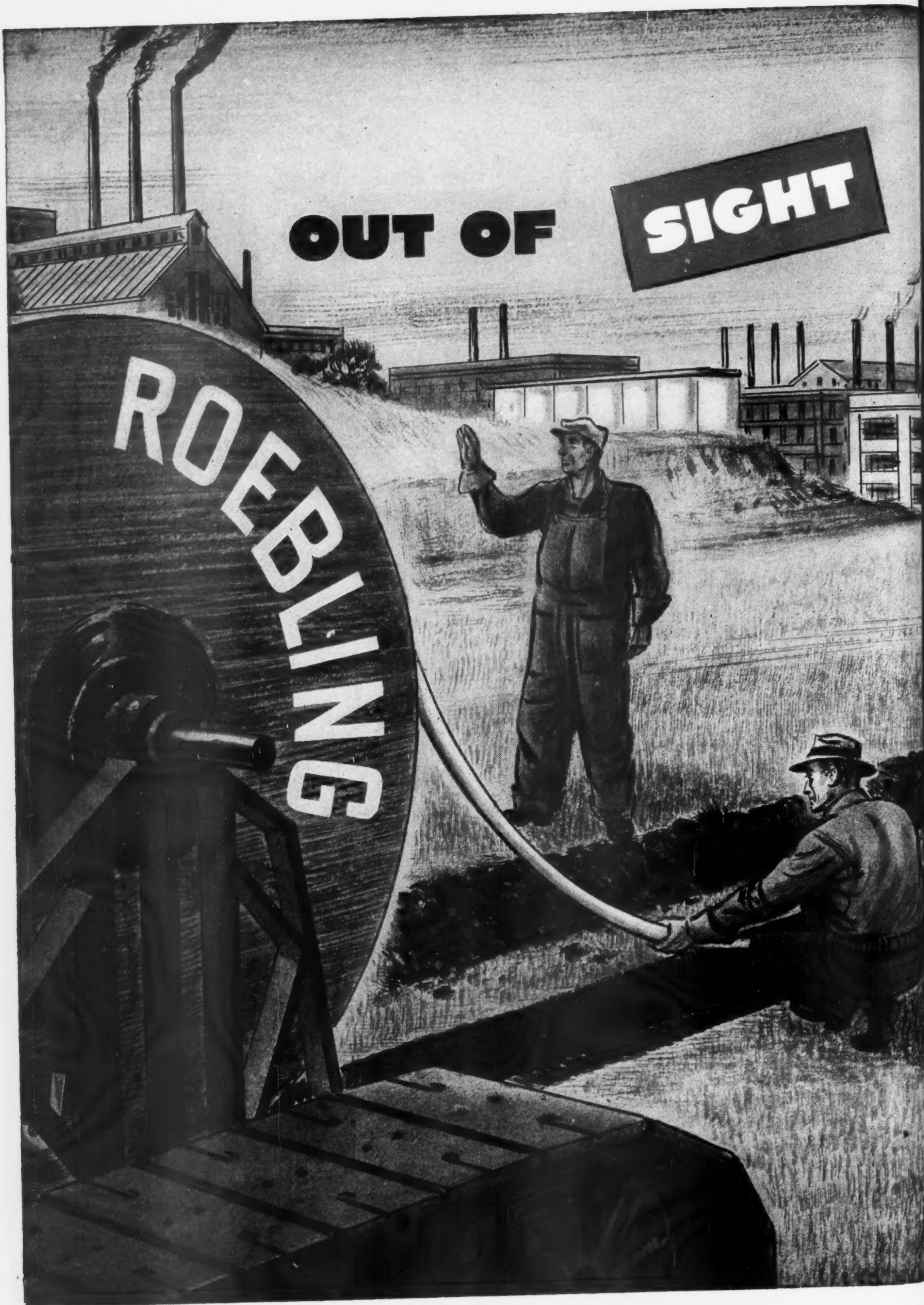


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Roebling Parkway Cable is available with metallic armor or with a non-metallic, moisture-

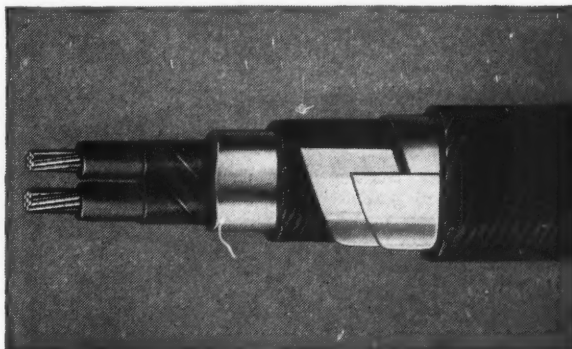
impervious sheath which affords remarkable physical protection. Both come in single and multiple conductor types—solid or stranded—in a range from 600 to 5000 volts.

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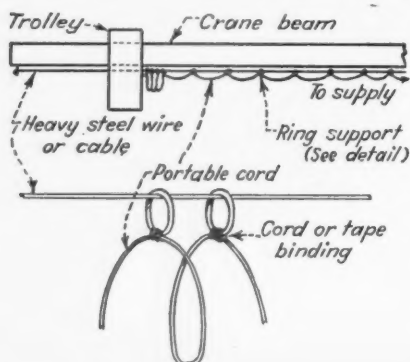
QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay \$5.00.

Reader's Quiz

Overhead Crane

Q **UESTION 290**—We have a three ton overhead crane in our impregnating room where we varnish dip field coils. This crane has a rigid box type bridge with a forty foot span, the rails are of T bar suspended from insulators on five foot centers the full length of the bridge. The collector shoes are the sliding type and carry adequate tension with proper shunts, the rails are as clean as can be maintained but in spite of this condition when power is applied to either trolley or hoist motor, we pull an arc at these shoes. As stated already, this crane travels over these dip tanks full of varnish and the arcing of collectors has cost us one fire. These tanks have covers on them but in our effort to provide safe working we are still confronted with a human element which can hardly be classed as infallible. We would not desire a repetition of this incident. Therefore, a recommendation of some type of explosion proof installation would be desirable or any other suggestion by which we could eliminate this hazard, would be welcomed and considered.—D.J.S.

A. **TO QUESTION 290**—A similar problem was solved by the use of suitable portable cords so that the collector shoes may be eliminated. A cord of the required number and size of conductors is selected and attached



to rings or clips that slide on a suitable wire. The rings are spaced at approximately 5 ft. intervals and move back and forth with the traveling crane. The sketch 290 shows the general arrangement for supporting the portable cord.

The cord should be of sufficient length that when extended its full length, the strain will not be great on the rings. As operating length is shortened by pushing rings along, the cord assumes a general coiled shape. I believe this arrangement will work very well for you. Your control equipment, of course, should be explosion proof.—L.R.B.

A. **TO QUESTION 290**—This case of trouble might be comparable to one I had to deal with while shooting trouble on the cranes that handled the concrete during Panama Canal construction days.

Similar rails and collector shoes to those described in the question were used on these cranes. Arcing often occurred and sometimes collector shoe contact was so poor that the operator had no control of the equipment.

This was caused by rust or a film of some sort that formed on the rails.

I overcome the trouble by making sheet metal caps to fit over the collector shoes having prick punched the contact surface of the caps to resemble a nutmeg grater.

These caps were installed periodically and after a few trips with the cab they were removed and the trouble corrected.

If present day metals were used for rails, such as stainless steel, or if bars of stainless steel were fastened to the present rails no doubt they would form a better contact surface. Another set of collector shoes in tandem with the present shoes and a few inches apart would also improve the contact.

I know of no method to make the job explosion-proof.—B.A.S.

A. **TO QUESTION 290**—It is my opinion that the trouble D.J.S. is experiencing is due to the control methods on his hoist and trolley. From his description, arcing occurs only at moment of starting, which

indicates that the inrush current to the motor is excessive. It may be that this particular crane starts directly on the line, if so, a resistance type starter, preferably push button operated, should be installed, if he already has resistance type manual controllers installed, then he will have to instruct the operators in the proper handling of them. As a further aid he could try inserting carbon blocks in the collector shoe face. This will give better conductivity and coat the rail with a fine graphite film which will also help. This carbon insert must be of a very hard grade and any burrs on the collector rail must be smoothed off before running or the carbon life will be very short.—T.J.H.

A. **TO QUESTION 290**—As a solution to the problem of D.J.S. I would suggest the installation of a duct type of insulated trolley with a caterpillar type of collector. It is absolutely non-arcing and requires no maintenance.

It is naturally not rated explosion-proof but evidently the location in question is not a Class I or he would have to have an explosion proof motor, etc.—E.O.P.

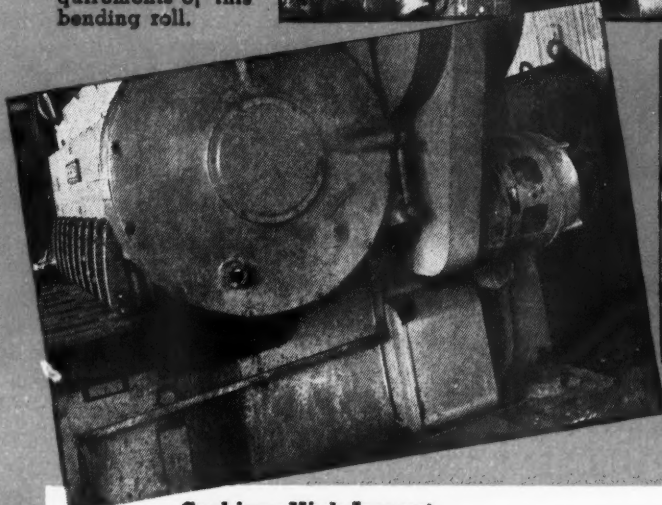
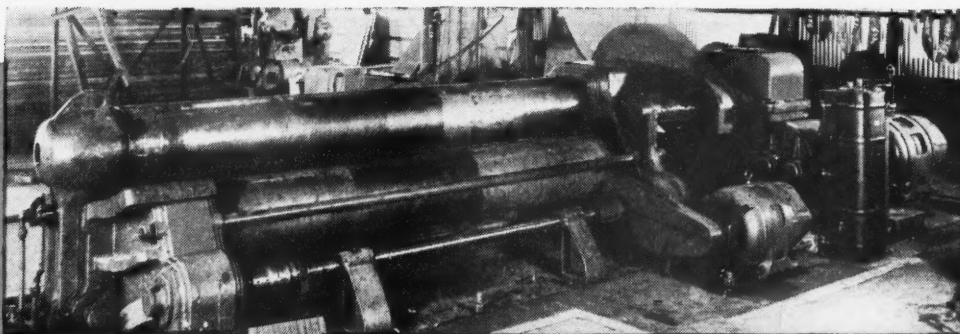
Moisture In Magnetic Chucks

Q **UESTION 291**—There are quite a number of magnetic chucks used in our plant. Can any of our readers suggest a remedy to eliminate moisture that forms inside the case?

We have used many kinds of compounds for sealing, in an effort to keep the inside of the magnetic chuck dry, but all to no avail.—W.H.L.

A. **TO QUESTION 291**—To keep moisture out of magnetic chucks requires constant care. A regular period of inspection should be set up with a frequency such that no trouble will be experienced between inspections. This can only be determined by your conditions and past

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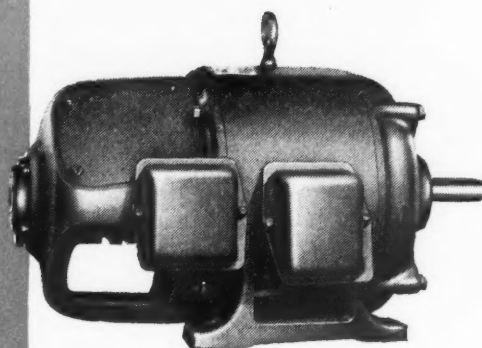
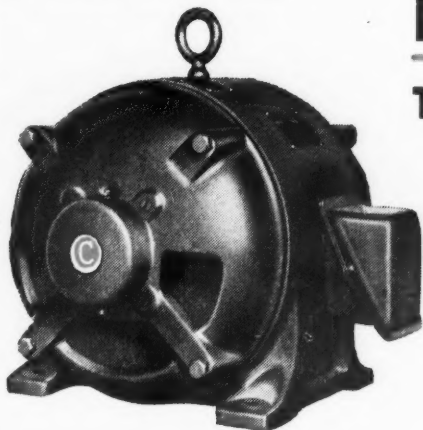
Provides Smooth Continuous Power—Century 2 horsepower SC motor supplies power for this steel cutoff saw.

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$1\frac{1}{2} \times 1 \times \frac{3}{8}$			A01	B01	$2 \times 1\frac{3}{4} \times \frac{1}{2}$			A25	B25
$1\frac{1}{2} \times 1 \times \frac{1}{2}$			A02	B02	$2 \times 1\frac{3}{4} \times \frac{5}{8}$			A26	B26
$1\frac{1}{2} \times 1 \times \frac{3}{4}$			A03	B03	$2 \times 1\frac{3}{4} \times 1$			A27	B27
$1\frac{1}{2} \times 1\frac{1}{4} \times \frac{1}{4}$			A04	B04	$2\frac{1}{2} \times 1 \times \frac{3}{8}$			A28	B28
$1\frac{1}{2} \times 1\frac{1}{4} \times \frac{3}{8}$			A05	B05	$2\frac{1}{2} \times 1 \times \frac{1}{2}$			A29	B29
$1\frac{1}{2} \times 1\frac{1}{4} \times \frac{1}{2}$			A06	B06	$2\frac{1}{2} \times 1 \times \frac{3}{4}$			A30	B30
$1\frac{1}{2} \times 1\frac{1}{4} \times \frac{3}{4}$			A07	B07	$2\frac{1}{2} \times 1 \times 1$			A31	B31
$1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{4}$			A08	B08	$2\frac{1}{2} \times 1\frac{1}{4} \times \frac{3}{8}$			A32	B32
$1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{8}$			A09	B09	$2\frac{1}{2} \times 1\frac{1}{4} \times \frac{1}{2}$			A33	B33
$1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$			A10	B10	$2\frac{1}{2} \times 1\frac{1}{4} \times \frac{3}{4}$			A34	B34
$1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{4}$			A11	B11	$2\frac{1}{2} \times 1\frac{1}{4} \times 1$			A35	B35
$2 \times 1 \times \frac{3}{8}$			A12	B12	$2\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{8}$			A36	B36
$2 \times 1 \times \frac{1}{2}$			A13	B13	$2\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$			A37	B37
$2 \times 1 \times \frac{3}{4}$			A14	B14	$2\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{4}$			A38	B38
$2 \times 1 \times 1$			A15	B15	$2\frac{1}{2} \times 1\frac{1}{2} \times 1$			A39	B39
$2 \times 1\frac{1}{4} \times \frac{3}{8}$			A16	B16	$2\frac{1}{2} \times 1\frac{3}{4} \times \frac{3}{8}$			A40	B40
$2 \times 1\frac{1}{4} \times \frac{1}{2}$			A17	B17	$2\frac{1}{2} \times 1\frac{3}{4} \times \frac{1}{2}$			A41	B41
$2 \times 1\frac{1}{4} \times \frac{3}{4}$			A18	B18	$2\frac{1}{2} \times 1\frac{3}{4} \times \frac{3}{4}$			A42	B42
$2 \times 1\frac{1}{4} \times 1$			A19	B19	$2\frac{1}{2} \times 1\frac{3}{4} \times 1$			A43	B43
$2 \times 1\frac{1}{2} \times \frac{3}{8}$			A20	B20					
$2 \times 1\frac{1}{2} \times \frac{1}{2}$			A21	B21					
$2 \times 1\frac{1}{2} \times \frac{3}{4}$			A22	B22					
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records. When a chuck is brought in for inspection, it should be carefully cleaned, then visually inspected for defects, then checked for ground, after which it should be energized and dusted with a fluxing powder (cast iron filings). If there are any cracks or improperly tightened joints, the flux will group itself around them. If everything is perfect so far, the chuck should be opened and dried out either in an oven or by energizing until the compound is hot enough to drive out all moisture. Before reassembling, all parts should be brought to the same temperature, preferably above room temperature, then the base and cover joints should be thoroughly cleaned and assembled taking care to tighten down on all screws evenly. At opposite locations a ground test should again be taken and the readings checked against the before inspection readings and also entered on the chuck's record card for future reference. If the holding surface is worn, which should be checked with a straight edge, have the surface renewed by grinding before the chuck goes into service.—T.J.H.

A. TO QUESTION 291—Moisture would likely come from either of two sources, condensation of water from breathing of the chuck, as it is practically impossible to prevent breathing, and from liquid coolant used with the machine. As you say moisture forms inside the case, I assume trouble is due to condensation. I would suggest the installation of a small strip heater inside the case that would be left on continuously or turned on either manually or automatically when the chuck is turned off. The higher temperature maintained inside should prevent condensation.—L.R.B.

A. TO QUESTION 291—In the plant where I am employed we have approximately 36 Browne & Sharpe surface grinders requiring electromagnetic chucks. These chucks are constantly under danger of water as water with its compound is used to wash away the grinding while in operation.

However, we have had similar trouble as you describe.

We begin by removing the surface chuck complete from the machine and turn it face down upon 2 sheets of wood so as to prevent damage to its surface. Then we remove all screws from the plate (bottom plate) leaving the plate of the surface chuck exposing its coils and paraphine (or beeswax). You now take these two plates, bottom plate and electromagnetic plate, and

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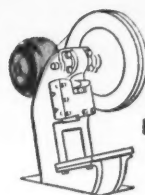


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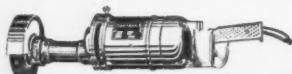
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ELECTRIC HAMMERS



ELECTRIC DRILLS

New **LIGHTWEIGHT ELECTRIC PLANT**

**5000
WATTS D.C.**



Weights only 315 lbs.!

Use fast-working electrical tools on any construction or maintenance job with this high capacity, portable, compact electric plant. Equipped with four-receptacle box for direct plug-in of tools or lights. Available with carrying frame, or dolly-mounted. Powered by Onan 10 HP, two-cylinder, 4-cycle, air-cooled engine. Shipped complete . . . ready to go!



Write for catalog

NEW ONAN "CK" ELECTRIC PLANTS are available in 5000 watts D.C., 115 and 230 volts; 2000 and 3000 watts A.C. in all standard voltages. COMPLETE ELECTRIC PLANT LINE INCLUDES: A.C.—350 to 35,000 watts in all standard voltages and frequencies. D.C.—600 to 15,000 watts, 115 and 230 volts. Battery Chargers—500 to 6,000 watts, 6, 12, 24, 32 and 115 volts. ONAN AIR-COOLED ENGINES—CK: 2-cylinder opposed, 10 HP. BH: 2-cylinder opposed, 5 1/2 HP. 1B: 1-cylinder, 3 1/4 HP.

D. W. ONAN & SONS INC.
2142 Royalston Ave., Minneapolis 5, Minn.

ONAN ELECTRIC PLANTS

place in an oven for one hour at 100° F. heat. When this has been done, you must work fast and secure. Drain out all possible paraphine or beeswax from chuck. Then check all coils for possible grounds and shorts. If O.K., then replace the paraphine or beeswax and make sure you have enough paraphine that you must show a definite amount by overflowing it over all its edges.

By the time the paraphine wax solidifies, you will note that the center area where the greatest amount of paraphine is located, there appears a sunken spot which most always is below the surface of the steel rim of your chuck. When this has cooled off, you may scrape off all extra paraphine or beeswax that is above the rim of your chuck. Now remove your back plate from the oven and place it back on your chuck, making sure that it is very clean and also put a coat of shellac over the edge of your chuck. When back plate is mounted upon the chuck, it will stick to the shellacked edge of the chuck. When putting your screws on, put them all on and begin tightening them from the center and work outward and make sure that they are tight when finished but do not forget to put paraphine over the screws when completed, as this is a preventative against moisture.

Replace your electromagnetic chuck upon the machine and releve it well so that operator will not have to remove any more of the surface as possible.

This method has been quite successful when care has been shown while doing this job.—O.C.

Coil Groupings

QUESTION 292—How do you go about arranging the groups in a three phase induction motor when the number of slots makes it necessary to have the coils in some of the groups smaller in number than the rest?—F.H.L.

A. TO QUESTION 292—The number of coils per pole-phase group may be found by dividing the number of slots by the product of the number of phases and the number of poles. When the result is a whole number, the number of coils per group is the same for each group. When the result is not a whole number, however, it is necessary to group the coils unequally but in such a manner as to preserve winding symmetry. While a thorough discussion of the rules concerning unequal groupings would require wider space, we may illustrate

a possible case by assuming numerical values.

Example: Let us consider a 4-pole, 3-phase motor with 48 stator slots and coils which is to be rewound 6-pole, 3-phase, at the same frequency and voltage. Each coil has 20 turns and spans 10 slots.

The number of 4-pole coils per phase is 48 slots/3 phases = 16. The number of coils in each pole-phase group is 16 coils per phase/4 poles = 4. The total number of turns per phase is 16 coils per phase x 20 turns per coil = 320 turns. For full pitch or 180 electrical degrees, each coil would have to span 48 slots/4 poles = 12 slots. The chord factor, which is a measure of the effectiveness of this winding, is $\sin(\frac{1}{2} \times 10/12 \times 180) = \sin 75 \text{ deg.} = 0.966$.

When rewinding this core 6-poles, it is found that for full pitch, each coil would have to span 48 slots/6 poles = 8 slots. In order to keep the effectiveness of the winding the same as on the 4-pole winding, the pitch must remain at the same percentage of 10/12 or 83.3%. With 8 slots per pole as full pitch, the same percentage effectiveness in the 6-pole winding may be obtained with 8 slots x 0.833 = 6.67 slots. If we decide on 6 slots in order to eliminate the fractional slot span, the effectiveness of the resulting winding will be $\sin(\frac{1}{2} \times 6/8 \times 180) = \sin 67.5 \text{ deg.} = 0.924$. The effectiveness of the winding is thus decreased in the ratio of the respective chord factors, namely, 0.924/0.966 or 4.5 percent.

The new number of coils per pole-phase group, 48 slots/(3 phases x 6 poles) = 2.67. Inasmuch as this is not a whole number, it is necessary to distribute the 48 coils in 12 pole-phase groups of 3 coils each (36 coils) and 6 pole-phase groups of 2 coils each (12 coils). These coils could be arranged in the sequence of 332, 323, 233, 332, 323, and 233 with pole-phase groups of 332, 332 coils for each phase around the stator each with coil sides in slots 1 and 7, etc.

Considering the new number of poles and the changed chord factor, the new number of turns per phase will be:

$$T_2 = T_1 \times \frac{P_2}{P_1} \times \frac{k_1}{k_2}$$

$$= 320 \text{ turns} \times 6/4 \times 0.966/0.924$$

$$= 500 \text{ turns.}$$

—R.G.C.

A. TO QUESTION 292—Motor manufacturers frequently have designs that call for odd coil groupings, and in most instances, satisfactory performance will be obtained as long as (1). The coils per phase for a series connection are equal or (2) if a parallel connection is used, the total coils

BETTER PERFORMANCE
DEPENDABLE PERFORMANCE
LONGER PERFORMANCE

P.R. MALLORY & CO., Inc.

MALLORY

CAPACITORS



TYPE P—AC Motor Starting Capacitor

The **plastic** case prevents moisture absorption and lengthens operating life. An excellent replacement for aluminum case capacitors with cardboard sleeves. For original equipment use, or if bracket as well as capacitor needs replacement, a splash-proof plastic end cap and easy-to-install "snap-on" mounting bracket are available.

TYPE MSG

AC Motor Starting Capacitor

The new foolproof Type MSG capacitor—with original equipment terminal spacing—is easy to install—no chance for error. The MSG is small and compact—**It Fits!**



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The Shoemaker's Son May Go Barefoot

But when a motor manufacturer has electrical equipment that fails frequently because of high operating temperatures, he uses DC Silicone Insulation. Take an absorption type dynamometer, for example.

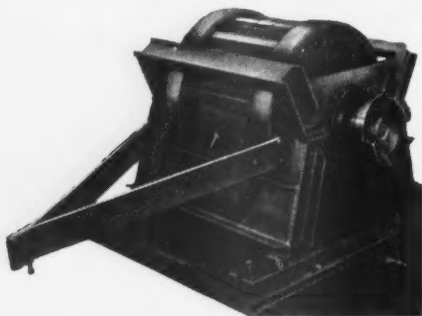


PHOTO COURTESY HOWELL ELECTRIC MOTOR COMPANY

Using a 75 h.p. frame and stator, Howell engineers designed and built this absorption type dynamometer to determine torque in electric motors. They chose this type of dynamometer because motors are easily hooked up and readings are quickly made. The idea was good but Class 'B' insulation wasn't good enough.

Average life of the windings was limited to 2 to 3 months and only motors of 75 h.p. or less could be tested without burning out the windings. To this practical problem the Howell engineers found the practical answer. After several failures they rewound the dynamometer with our Silicone (Class 'H') Insulation.

Results were even better than they hoped. The silicone insulated dynamometer has been in service now for 18 months—over 6 times the average life of Class 'B' windings—and the insulation is still in excellent condition. Furthermore, the dynamometer is being used to test motors ranging up to 150 h.p.—twice the previous capacity.

That's just another one of the many field reports that confirm the findings of our Motor Test Laboratory—DC Silicone Insulation has at least 10 times the life and 10 times the wet insulation resistance of Class 'B' under similar operating conditions. If you want more evidence of the superiority of Silicone Insulation write for leaflet G 4-K.

DOW CORNING CORPORATION MIDLAND, MICHIGAN

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in each circuit must be equal per phase.

However, a theoretically balanced winding can be obtained by using the "Least Common Multiple" method. This scheme is thoroughly explored in the text "Connecting Induction Motors" written by Dudley and published by McGraw-Hill Book Company. This method is not difficult to follow, and the book contains convenient reference charts for various combinations of poles and slots.—E.E.E.

Can you ANSWER these QUESTIONS

QUESTION Q13—I have a 6 fan d-c .034 amp. each Modine hot water heater system in a plant. The service is 110-220 a-c single phase 60 cycle. How can I change the a-c to d-c inexpensively?—J.A.S.

QUESTION R13—One of our college buildings is being changed from 110 volts 3 phase to 120/208, 4 wire. We have one 1 h-p 3 phase, 110 volt motor that is inaccessible and we would rather not disturb it for rewinding. The motor is connected to an acid fume hood fan and rated at 1 h-p, 110 volts, 6 amperes. This drive is over motored and as we find that 3 amperes are required to do the work, it is proposed to use GE CR 9006 resistors permanently connected to each leg regardless of the waste of current.

Should the resistors be rated at full load current (6 amp.) or actual (3 amp.) as recorded by the instruments?—L.G.D.

QUESTION S13—How do you determine the capacity of a condenser for a capacitor-run motor? Is there a formula such as is used for capacitor-start motors, and if so, what is it? The first mentioned formulae has been used by our motor shop many times with success. That is why in the absence of manufacturers specifications we are looking for the requested information for a method of figuring capacitor-run motor condensers.—L.R.D.

QUESTION T13—What effect will it have on the performance of a three phase dip-ring or squirrel-cage induction motor, if, in making emergency repairs, like cutting out one or more grounded or shorted coils in the stator, say for example, two coils must be cut out and these two coils are a complete pole-phase group? Will the motor run at the right speed with a complete pole missing?—W.A.B.

PLEASE SEND IN
YOUR ANSWERS BY OCTOBER 15

FOR SAFETY'S SAKE USE DAYTON SAFETY LADDERS AND SHOES

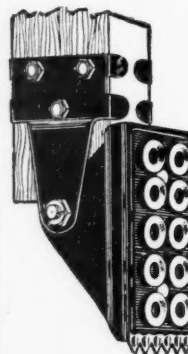
"Listed by
Underwriters' Laboratories, Inc."



Sizes 3 feet to 16 feet in height with standard rubber safety shoes at no extra cost. . . .

Daytons are constructed of tested airplane spruce and reinforced with rigid steel supports to give great strength and lightness of weight.

Handrails of steel guard the large roomy platform for added safety. Half of platform can be raised to form an extra step, when needed. These famous ladders can be set up instantly, are easy to carry and fold compactly for storing. Automatic locking feature insures safety while ladder is in use.



Install Dayton Safety Ladder Shoes on your present straight ladders.

Instantly converted for either indoor or outdoor use.

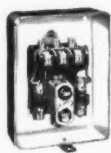
Made of No. 16 gauge and the side plates are of No. 13 gauge steel. Suction grip treads are renewable. Lock nuts and spring washers insure proper adjustment. Easy to install.

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COMPLETE INFORMATION

DAYTON-HARKER CO.
2240 Gilbert Ave. Cincinnati, O.



When you plan that new production line
you'll find the right control for every machine
in the Allen-Bradley line



**Manual
Starters**



**Solenoid
Relays**



**Small
Solenoid
Starters**



**Large
Solenoid
Starters**

Are you making any plant layout changes?
 What about your motor controls?

You can get the best production efficiency if each machine has exactly the right starter . . . the right push button . . . the right limit switch.

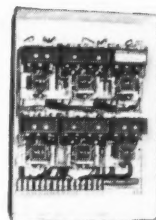
They are all available . . . in the big Allen-Bradley line. On special drives you can work out remarkable timesaving and laborsaving control combinations with Allen-Bradley relays, timers, drum switches, contactors, and pilot lights. And Allen-Bradley engineers are always glad to help you.

Why not write for the 48-page Allen-Bradley catalog, today!

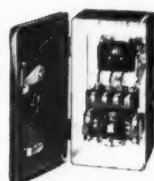
ALLEN-BRADLEY CO.

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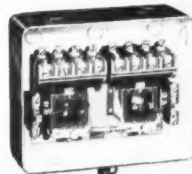
Milwaukee 4, Wis.



**Multispeed
Starters**



**Combination
Starters**



**Reversing
Switches**

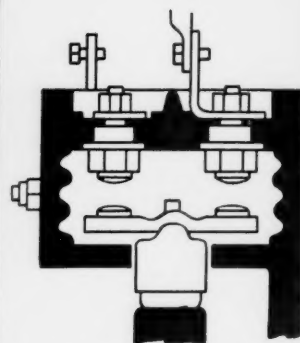
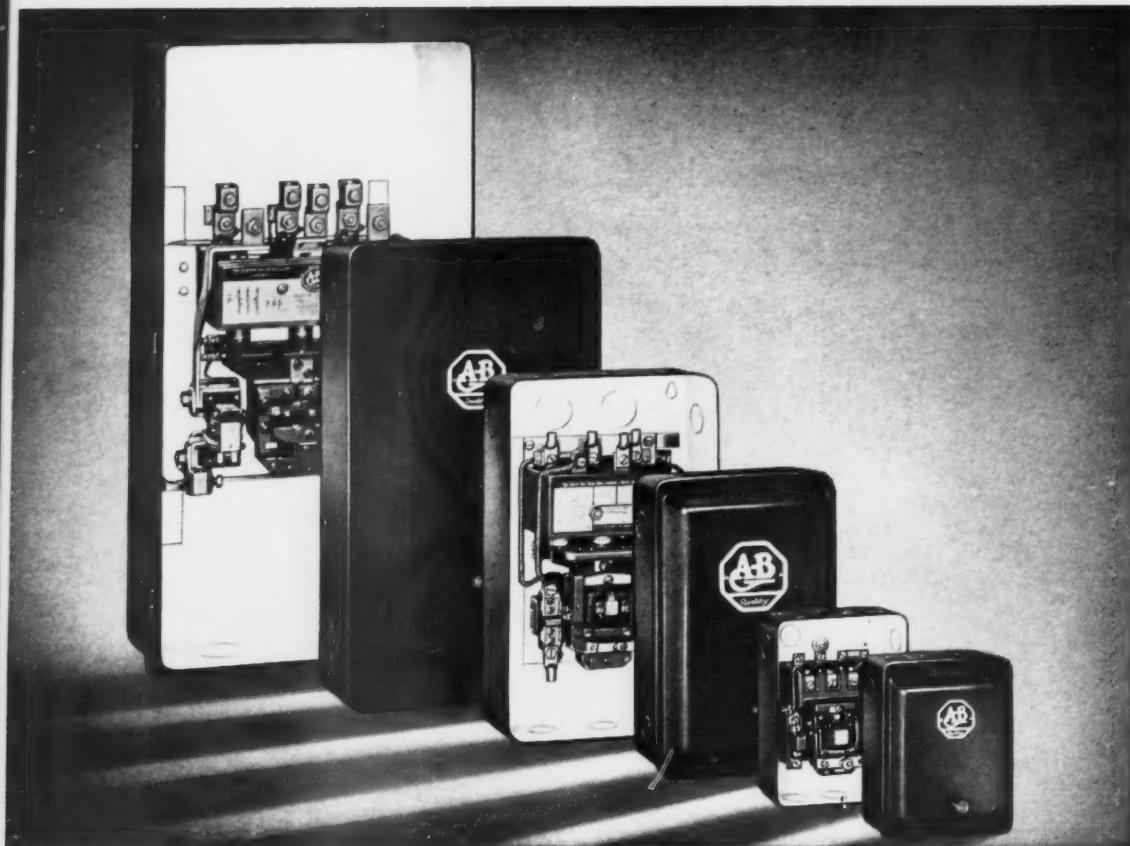


ALLEN-BRADLEY

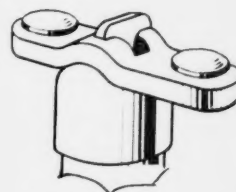
MANUAL & AUTOMATIC

QUALITY

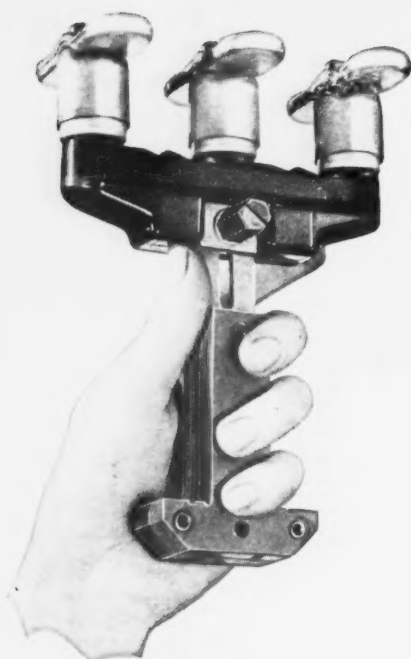
MOTOR STARTERS



Sectional view of contact enclosure showing simple up-and-down action of contacts in arc hood.



All Allen-Bradley Solenoid Starters have double-break, silver-alloy contacts — no jumpers—nothing to interfere with instant opening and closing of contacts.



**No Pins • No Pivots
No Hinges • No Bearings**

The solenoid plunger carries the three moving contacts that operate within arc hood. Nothing could be simpler or more reliable.

Count the Moving Parts . . .

ONLY ONE!

Therefore—

**Count the Trouble-Free Operations
MILLIONS OF THEM!**

That's the real secret of Allen-Bradley controls . . . there is **ONLY ONE MOVING PART** . . . no trouble-making gadgets like bearings, pins, pivots, hinges, or jumpers. With **ONLY ONE MOVING PART** there is little chance for trouble. Hence . . . **MILLIONS OF TROUBLE-FREE OPERATIONS.** With 8 or 10 or more moving parts, you can almost bet on having trouble.

It is simple arithmetic . . . that is how it adds up. It also explains why Allen-Bradley controls are the first choice of machine tool builders.

Make your controls trouble free . . . maintenance free . . . complaint free. Just specify Allen-Bradley when you order motor controls.

ALLEN-BRADLEY CO.

1316 S. Second St.

Milwaukee, Wis.

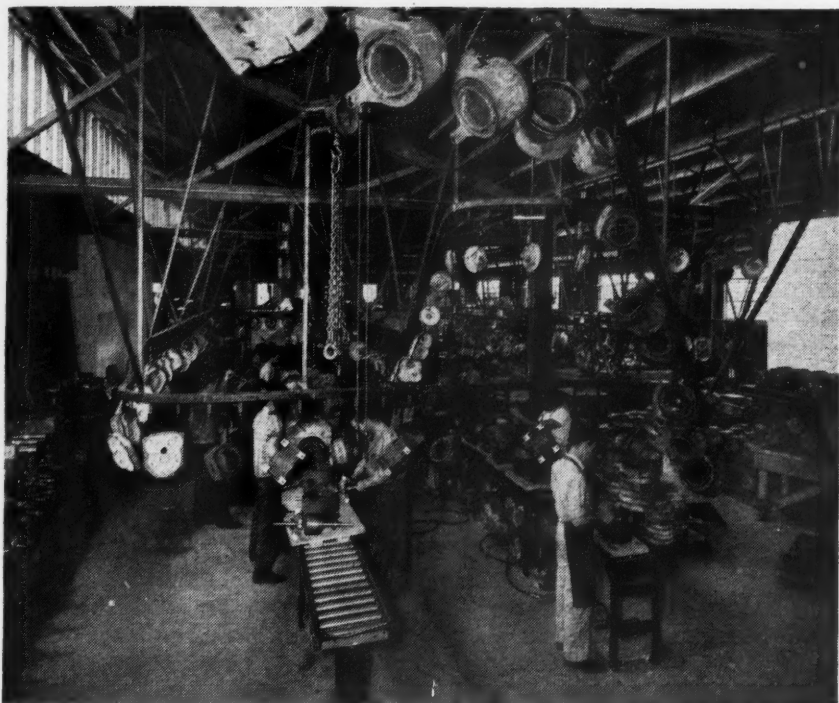
ALLEN-BRADLEY
SOLENOID STARTERS
QUALITY



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BRIEF ARTICLES about practical methods of installation and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

Practical Methods



Overhead and gravity conveyor systems carry motor parts from one production station to the next at speeds determined to best meet the schedules of individual workers. Handling charges are materially reduced by electrical-mechanical means of moving material.

Overhead Conveyor Cuts Handling Costs

—PRODUCTION

Increasing productive capacity while reducing production costs is a major problem in the present industrial picture. This is being accomplished through redesign of products, new methods and modern equipment in manufacturing plants. Due to such technological developments, the same number of productive workers can produce more goods with less effort in the same area. One bottleneck in the production picture, however, is the non-productive man-hour total required for handling materials. This contributes nothing to the manufactured value of the product yet is required to keep productive workers supplied with materials upon which they can expend their value-building abilities. In many industries, the cost of handling material behind the production line is greater than the charges directly related to manufacturing. By mechan-

ically and electrically moving material during production processes from one station to the next, such non-productive charges can be reduced, workers' efforts can be up-graded and production objectives can be achieved.

The use of motorized conveyors can be advantageously employed in many plants to accomplish this objective. For best results, production flow should be studied and time studies recorded for all operations involved from the time of receiving raw materials until the finished product is packed for shipping. In some cases, it will prove advantageous to relocate some departments so that the production cycle can be served by modern mechanized materials-handling methods. The next step is to gear conveyor systems to the movement of component parts, sub-assemblies, assemblies and finished products so that a steady flow of work

is fed to each worker at the point of performing each operation. For this reason, various segments of conveyor systems are regulated at different speeds.

Sterling slow-speed electric power drives are used to power the overhead and gravity conveyor systems that handle parts and finished units in the factory producing Sterling motors. Motors range from 1 to 15 hp. while speeds can be selected from 18- to 580 rpm. These speeds and capacities meet the majority of conveyor requirements and, due to drip-proof construction, mounting in any position is possible. Of particular aid is the possibility of varying conveyor speeds by turning the handle on the speed-trol. In any plant where production flow follows a standard path, conveyors can and have cut handling charges to a third of their initial level.

Field Rheostat Boosts Power Factor

—INDUSTRIAL

Improving the power factor in a large rubber mill eliminated the necessity for additional capacity, according to a report submitted by the Maintenance Company, Inc., New York City. Not only was this solution the most economical answer to the capacity problem, but it eliminated the necessity for securing scarce generating equipment and also resulted in the conservation of plant floor space. While the method adopted was born from necessity, the results were completely satisfactory.

The largest machine in the plant was a 400 hp., 3-phase, 60-cycle wound rotor machine with a low-voltage high current double-commutator d-c generator, similar to those used for plating work, connected to the secondary or rotor circuit as diagrammed. The fields of the low-voltage d-c generator were separately excited by a generator coupled to the main motor by means of V-pulleys. This field was manually adjusted through a field rheostat. With this arrangement, the 400 hp. motor assumed the essential characteristics of

DESIGNED TO CUT YOUR COSTS **NOW**



Ivory and Brown

Pull chain on three-outlet socket controls only the lamp socket, leaving side outlets constantly available for use.

MONOWATT'S **NEW** PLASTIC CEILING

INCREASES EFFICIENCY. With wiring time worth nearly a nickel a minute, you'll be interested in the advantages of this New Monowatt Ceiling Receptacle. Molded of rugged plastic, the device comes in one, clean, simple unit. Gone are the clumsy internal mechanism . . . the fragile ring of outmoded porcelain. Instead, binding screws, taking No. 12 wire, are conveniently located. With fumbling eliminated, wiring becomes a quick, two-step job.

FITS 3¼ or 4 INCH OCTAGON BOXES and cuts your inventory 50%. Exclusive Monowatt break-off feature permits outer ring to be broken off when a 3¼ inch cover is desired for a 3¼ inch box.

BREAKAGE and SHIPPING COSTS REDUCED.

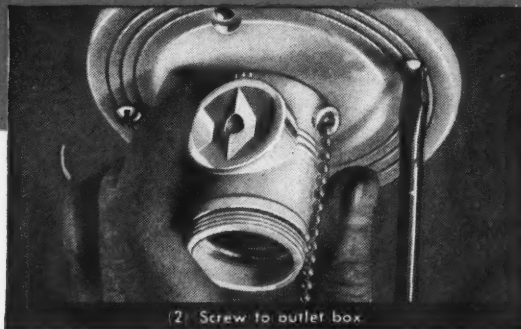
Plastic units weigh half as much as porcelain—are more resistant to chipping, cracking—will save you money on every shipment and reduce breakage losses right down the line.

COMMON SENSE DESIGN is an old story at Monowatt. Old-time switches, old-time wall plates, old-time sockets have been redesigned, simplified and improved for safer, better, more durable wiring . . . to speed wiring installation . . . to reduce electrical inventory requirements. Ask to see the whole line and you, too, will switch to Monowatt for a greater profit on any job.

YOUR WORK GETS DONE MORE QUICKLY...

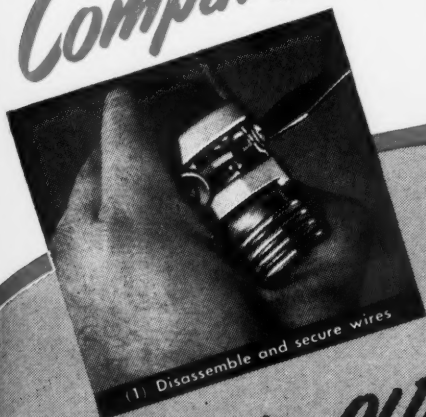


(1) Secure wires to binding screws



(2) Screw to outlet box

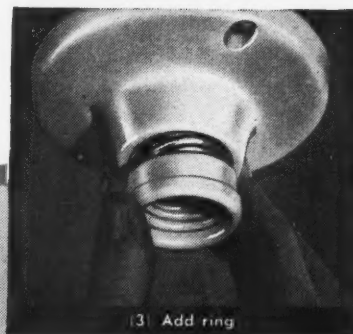
Compare the NEW



(1) Disassemble and secure wires



(2) Screw cover to outlet box



(3) Add ring

with the OLD!

RECEPTACLES

SAVE 4 WAYS WITH MONOWATT WIRING DEVICES

SIMPLIFICATION of many traditional wiring devices results in quicker, more efficient wiring...many products with multiple adaptations benefiting the user...a substantial cut in your inventory because a complete wiring job can be obtained from just a few basic Monowatt devices.

+ **PRODUCT DEVELOPMENT.** New, exclusive products have been created. Outmoded wiring devices have been replaced for safer, better, more durable electrical installations.

+ **MANUFACTURING KNOW-HOW.** Superior manufacturing methods at Monowatt are productive of better wiring for more people at lower costs.

+ **QUALITY CONTROL.** The Underwriters' Seal plus modern standards of quality processing insure long, trouble-free service from Monowatt products.

= **GREATER VALUE**

MONOWATT

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STOCKS IN MORE THAN
100 PRINCIPAL CITIES

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FIBERGLAS*

... helps to increase the supply of strip steel

One sure way to increase tomorrow's steel supply is to keep the mills running at uninterrupted full capacity, today. And one way to safeguard continuous operation is to use dependable insulation in the main drive motors.

Fiberglas-base Electrical Insulating Materials provide this assurance. Proof of their contribution to trouble-free motor performance can be found in mill after mill. Time and again they've demonstrated their effectiveness in combating the usual causes of motor failure: high heat, overload, moisture, dust, corrosive fumes, acids and oils.

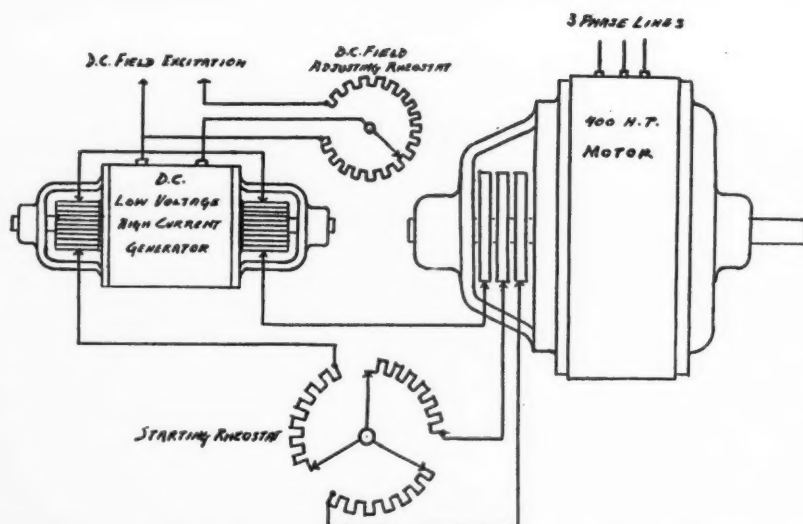
Even though only normal demands are placed on your electric power drives, you'll find it good insurance to have the added protection of Fiberglas-base electrical insulations. To give your old motors new life—specify Fiberglas rewinds. And to get peak performance—ask for Fiberglas insulation when you buy new motors. Let us show you complete case study data supporting these claims. Owens-Corning Fiberglas Corporation, Department 856, Toledo 1, Ohio. Branches in principal cities.

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INSULATING
MATERIALS**

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a synchronous motor. By keeping the field excited with a fixed magnetism through this d-c connection, the peaks and lulls of magnetism associated with the reversals of a-c were eliminated.

Amplidyne and X-ray Control Steel Mill

The world's fastest cold-strip steel mill at the Aliquippa Works of the Jones and Laughlin Steel Corporation at Pittsburgh are controlled by an X-ray measuring gage and an ampidyne; a small and uniquely designed generator which is used as an accurate measuring and control device. The mill, designed and built by the Mesta Machine Company, features the heaviest construction of any tandem cold-strip mill for tin-plate gages in the world. Machinery, weighing about 4000 tons, is anchored in steel-reinforced concrete foundations which descend to bedrock 50 feet below the ground level. With the new controls, designed and produced by the General Electric Company, the mill can be operated at a speed of 70 miles per hour. Coils, five miles in length, are rolled through the machines in less than five minutes.

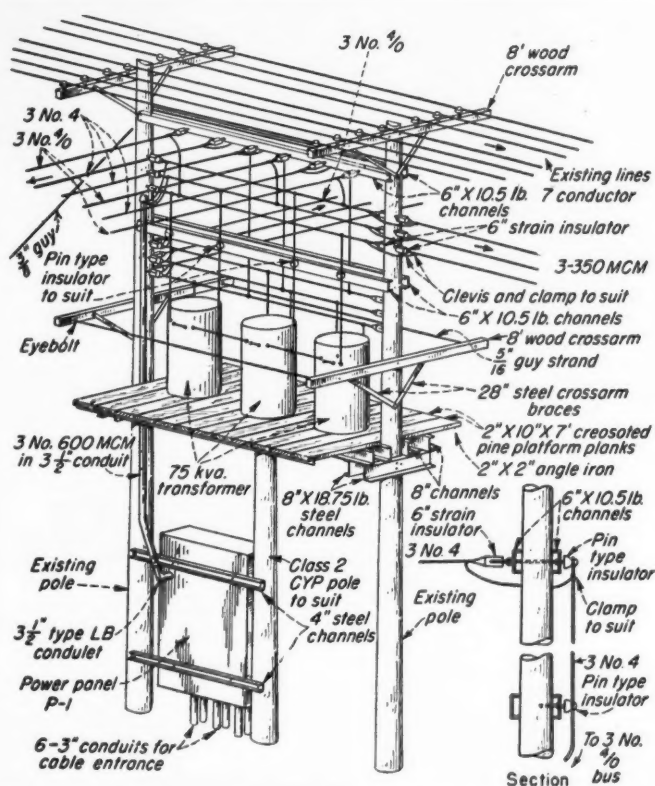



FIG. 1—Platform type transformer bank is mounted between two existing poles; uses chanel-iron structure and stub-pole; provides mounting for outdoor power distribution panel. Primary and secondary buses are above each other in same vertical plane. Overhead conductors are dead-ended on poles and cross channels above buses. Two crossarms and steel guy strands at transformer level provide safety "rail" for electricians working on the platform. Structure was designed and installed in a railroad yard by the Gustav Hirsch Organization, Inc., Columbus, Ohio, electrical contractors and engineers.



new T-47

*Lowest-Priced
High-Quality
Time Switch*

ever produced by ...  ...

General Electric precision engineering in this new low-priced (\$12.45 list) Handy Time Switch will help sell your customers and keep them sold. Features like the large silver contacts and the reliable Telechron* motor (synchronous, self-starting, and permanently lubricated) give long-range customer satisfaction, and help keep service calls to a minimum.

—your customers will want the T-47 because it...

SAVES ELECTRICITY—Lights and appliances operate only when wanted, are turned off automatically when not needed.

PREVENTS WASTE AND SPOILAGE—Automatic control reduces losses due to negligence.

SAVES TIME—Control of motors and machines releases operators for other essential work.

During any 24-hour period, the T-47 performs one ON-OFF operation (maximum On 22 hrs., minimum 5 min). It will continue to do so day after day without any further adjustment.



Handy switch with cover removed. Notice roomy wiring space. Knockouts and conveniently located terminal block permit easy installation.

FOR LOW COST
CONTROL OF

Motors, heaters, electric signs, coolers, and electrically operated valves.

URNS LIGHTS ON
AND OFF IN

Apartment halls, house yards, factory yards, poultry houses, store windows and greenhouses.

Get your share of the new T-47 business. Contact your nearest G-E agent, or write today for Bulletin GEA-4874: Apparatus Dept.; General Electric Company, Schenectady 5, N. Y.

*Reg. U. S. Pat. Off.

GENERAL ELECTRIC

dyne brain is set to maintain proper speed relationship between the motors. Irregularities are detected and automatically corrected. The device also makes it possible for the mill to accelerate from a threading speed of 300 feet a minute to more than 4500 fpm. in six seconds. In an equal time, the speed of the machinery can be reduced from 70 mph. to a standstill. Combined, the motors have a capacity of 16,800 hp. and can exceed 20,000 hp. with special insulation. Power is supplied by two m-g sets with a capacity of 14,220 kw.

The X-ray thickness gage, set to measure the thickness of the steel strip as it leaves the cold-strip mill, bombards the thin metal with an X-ray beam without physically contacting the steel in any way. Simultaneously, a second X-ray beam from the same source continuously penetrates a standard reference sample of steel of the desired thickness. A radiation detector measures and compares the intensities of the two beams after they have been transmitted through their respective targets. Differences in thickness between the sample and the actual strip are instantly detected.

The new control system, the first time applied to a cold-strip mill, is known as the "individual generator control system". Separate generators supply power to each of the six motors; a departure from conventional control systems used in the past. Outstanding advantages of the new system are the simplification of operating problems and the ability to roll a wider range of products on the mill. The tandem mill consists of five rolling units and a winding reel, arranged in a continuous line. The strip is reduced in thickness as it passes through each rolling unit and is wound under tension on the reel after the strip leaves the final rolling stand.

Square Duct Feeds Infrared Ovens

—WIRING

Long, overhead infrared bake ovens are used in the manufacturing process at the new Cambridge, Ohio plant of the Kingston-Conley Electric Company, Division of the Hoover Company. With a limit of six 375-watt infrared lamps per circuit, numerous individual circuits were necessary to serve the oven.

To bring the circuit conductors from the wall-mounted distribution panel to the oven and lamp strips, the Gustav Hirsch Organization, Inc., Columbus electrical contractors on the project,

WITH



You're sure of..

EASY BENDING

Any old timer will tell you that Central Rigid Steel Conduit has always been famous for its excellent bending properties. It gets that way because it is made from carefully selected steel that's as ductile as it is strong.

You'll find that most sizes of Central Conduit are easy-to-bend with an ordinary hickey. And when bent, it will not crack, crush or ripple . . . or damage its protective coating in any way.

Central Conduit is handled by a distributor near you. When you call him he will do everything he can to make deliveries as quickly as possible in spite of today's unprecedented demand.

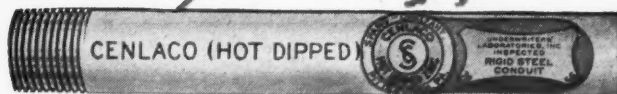
SPANG-CHALFANT

Division of The National Supply Company

General Sales Office: Grant Building, Pittsburgh, Pa.

District Offices and Sales Representatives in Principal Cities

*There's Tested Strength
in Every Length.*



CENTLACO a hot dipped galvanized and lacquered finish, inside and out.



CENTRAL WHITE electro-galvanized outside and black enameled inside.



CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

RCA TUBES FOR INDUSTRY



RCA-5557 mercury-vapor thyatron, directly interchangeable with CE-309, FG-17, NL-715, UE-967, and WT-272.

... a type for virtually every renewal requirement

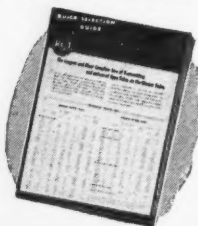
■ RCA industrial electron tubes are directly interchangeable with most other standard types ... and there are over 260 types available for immediate delivery!

For your convenience, RCA industrial electron tubes are now available directly from RCA or from your local RCA Tube Distributor.

The Fountainhead of Modern Tube Development is RCA

FREE Tube Guide

This folder contains the data you need for the quick selection of the more than 260 RCA industrial renewal types. Ask for Bulletin 2F403. RCA, Commercial Engineering, Section IT-77, Harrison, N. J.



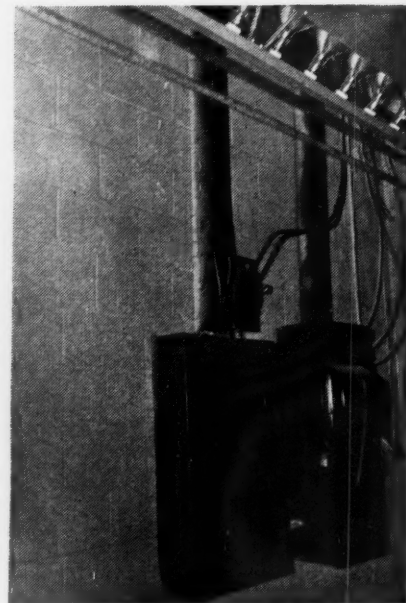
TUBE DEPARTMENT

RADIO CORPORATION of AMERICA
HARRISON, N. J.

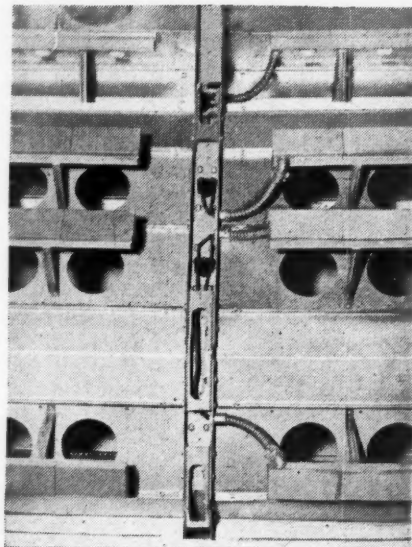
installed 4-inch square duct. One line of duct is mounted to the side of the oven and runs its full length. A second section connects this duct to the control panel.

Circuit conductors are placed in the square duct and enter built-in wiring channels that circle the oven at regular intervals. These channels are equipped with solderless connector blocks to which socket strip branches are connected through flexible conduit jumpers. Snap-on covers enclose the oven wiring channels when all connections are completed.

Should one of the socket strips go



Square duct carries multiple circuits from distribution panel to infrared oven above. Main disconnect switch at right is fed from an overhead bus duct line.



Closeup of a built-in wiring channel that circles oven. Note solderless connector blocks for lamp strip branches. Circuit conductors from duct raceway have not yet been installed. Snap-on cover encloses wiring channel.

The Same Conditions That Make Drinks Drip Cause Conduit Sweating and Wire Failures



Use **ROCKBESTOS A.V.C.** in Conduit Hot-Spots —— it's the Cable that **RESISTS CONDENSATION**

Permanent insulation of impregnated asbestos and high-dielectric varnished cambric, covered with tough impregnated asbestos yarn braid—means, among other things, that it resists moisture.

Every conduit run exposed to high temperatures collects condensation some time or other.

It's a tough combination that does a fast job of ruining ordinary wire and cable. Moisture seeps through cracks in dried out, heat-baked insulation causing grounds, short circuits and expensive re-wiring projects.

But millions of feet of Rockbestos A.V.C. wires and cables in miles of heat-exposed conduit are operating dependably under just such severe conditions. Their impregnated asbestos insulation and braid won't bake out or crack to admit moisture . . . they keep heat away from the varnished cambric . . . and they are highly resistant to corrosive fumes, flame, grease and oil.

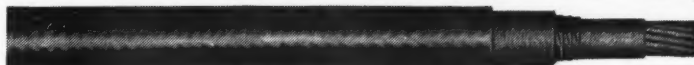
WRITE TODAY—for your copy of the new No. 10-F catalog, sectioned for easy reference to permanently insulated Power and Control Cables; Apparatus Wires and Cables; Lighting, Switchboard, Appliance, Fixture, Electronic and Magnet Wires.

ROCKBESTOS PRODUCTS CORPORATION

645 Nicoll St., New Haven 4, Conn.

NEW YORK CLEVELAND DETROIT CHICAGO
PITTSBURGH ST. LOUIS LOS ANGELES OAKLAND, CALIF.

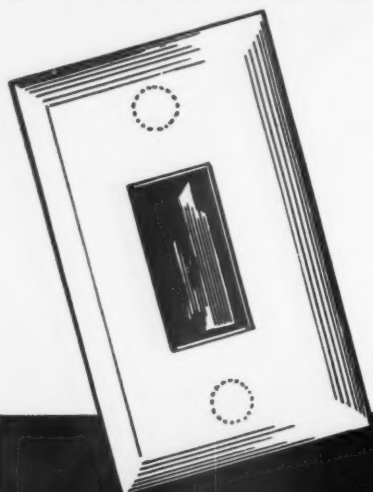
ROCKBESTOS



THE WIRE WITH PERMANENT INSULATION



**THE GREATEST THING
IN THE HISTORY
OF LIGHT SWITCHES!**



TOUCH-PLATE
LOW VOLTAGE
LIGHT CONTROL SYSTEM

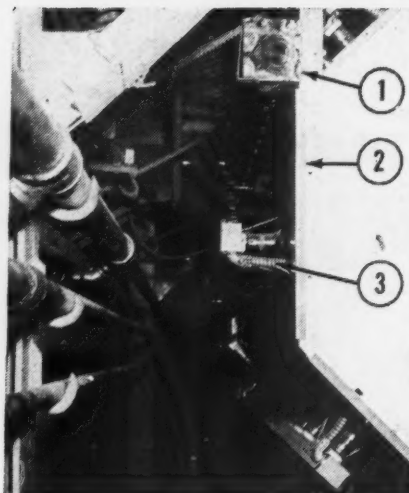
More switches, better switches, safer and more beautiful switches at virtually the same cost as old fashioned controls ...no wonder Touch-Plate is being acclaimed as the greatest thing in the history of light switches! Touch-Plate low voltage switches operate with a feather-touch on and off action...allow installation of multiple controls easily and inexpensively...there are *no conduits* to the switch itself! Let us tell you the whole story.

**Approved by
Underwriters' Laboratories**



THE RELAY DOES
THE WORK!

TOUCH-PLATE
DISTRIBUTORS, INC.
2038-42 Bay Street
Los Angeles 21, California



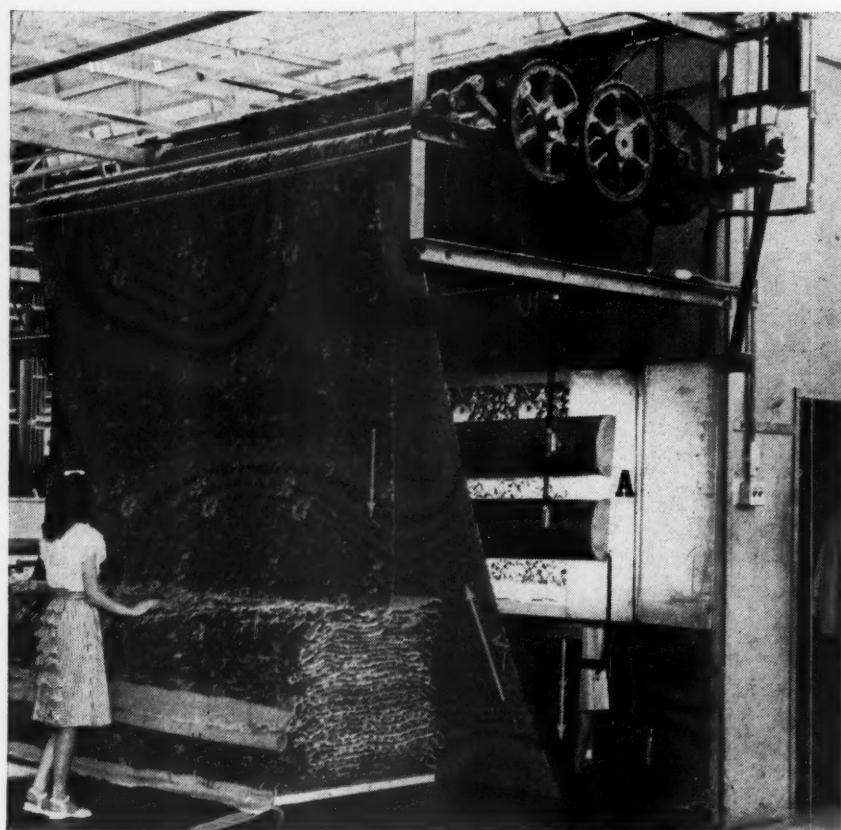
Electric service to infrared oven is provided by square duct raceway (1) built-in wiring channels (2) and flexible conduit connections (3) to lamp strips.

bad, it can be quickly disconnected for repair or replacement. Removal of four screws (holding channel brackets to oven), a flexible conduit connector, and loosening of two solderless connectors (in oven wiring channel) is all that is necessary. Unless a short occurs in the circuits feeding the oven, conductors in the square duct need not be disturbed.

Back Lighting for Carpet Inspection

LIGHTING

In the 17 acre wool processing and textile weaving plant of James Lees and Sons Company at Glasgow, Virginia (EC&M, March 1948), all finished carpeting is inspected for flaws with both direct and backlighting units before leaving the factory. Direct lighting is conventional; with fluorescent units mounted end to end in a continuous row above long examining tables where carpeting is examined. The backlighting units, here pictured, are also fluorescent. However, the reflectors are mounted so that light is directed sideways rather than down. As the carpeting passes slowly over guiding rollers and follows the path of the white arrows to the loading dolly, it passes directly in front of the backlighting units shown at position "A". An inspector on the opposite side of the carpeting from the light, scans the carpeting as it slowly descends in her field of vision. Since the inspector is in an unlighted booth, any light shining through flaws in the carpeting is quickly noticed. The inspector then pushes a piece of bright colored wool through this flaw and this marker indicates to the carpet finishers where additional work must be done.



Flaws in carpeting are detected and marked with lengths of bright colored wool yarn as the carpeting passes in front of fluorescent backlighting units in James Lees and Sons modern carpeting plant at Glasgow, Virginia.

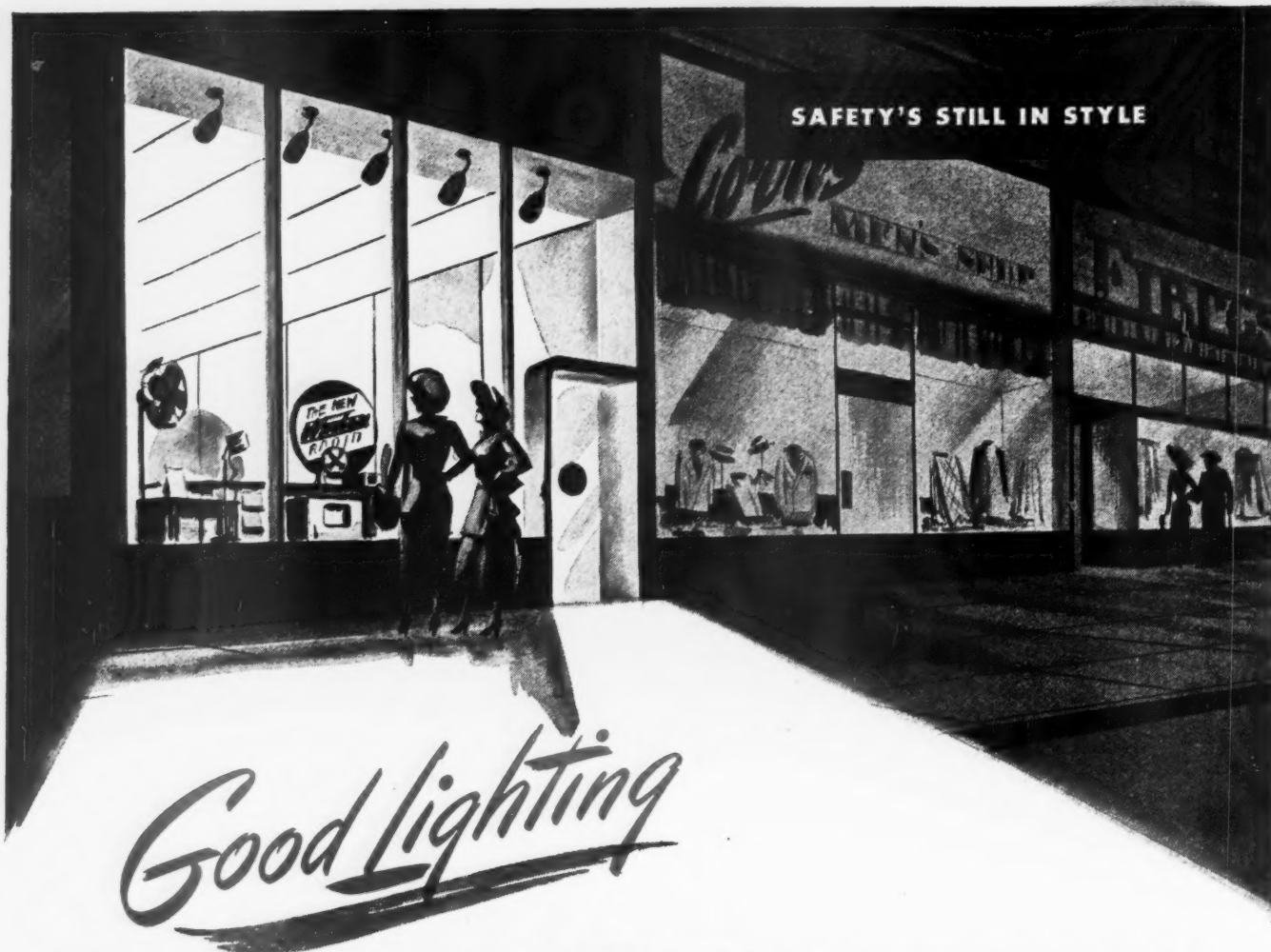
for the First Time **HEAT** is LICKED!



In the new line of Cutler-Hammer safety switches, the tables are turned. For here is a switch mechanism designed to withstand *safely* any degree of heat that can be expected from correctly selected fuses.

So dependable in performance, so easy to install, so convenient to operate, so attractive in appearance are these Cutler-Hammer safety switches, alert contractors everywhere are featuring them, recommended by Cutler-Hammer wholesalers from coast to coast. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin.





Good Lighting

THE MODERN PATHWAY TO SALES

Designers agree that the newest in store design calls for a lighting system that is planned to bring in sales.

Electricians agree that even the best designed system can't keep on building sales unless the wiring that goes into it is selected to give long-term, dependable service. Heat-beating Deltabeston is approved for use at temperatures as high as 125 C (257 F)—and it's built to cut troubles due to moisture.

Deltabeston, Type AF, fixture wire is flexible for easy handling, without injury to insulation. It's easy to strip for fast work. Smooth-finished, it fits easily into fixtures and other assemblies.

GENERAL  ELECTRIC

SAFETY'S STILL IN STYLE

*Protect it
with...*

DELTABESTON *

A new Deltabeston service. If desired, Deltabeston fixture wire can be supplied with ends tinned, ready to install. Completely eliminated are the bother and trouble that go with measuring and cutting wire to length, stripping and twisting ends, and tinning. And, the cost is so slight it will amaze you. For more information, fill in the coupon below.

*Trade-mark Reg. U. S. Pat. Office.

Section Y25-918

Construction Materials Department

General Electric Company, Bridgeport 2, Connecticut

Please send me:

- ☐ Information on Deltabeston, Type AF, fixture wire
- ☐ Free samples of Deltabeston
- ☐ Information on the new ready-to-install Deltabeston service

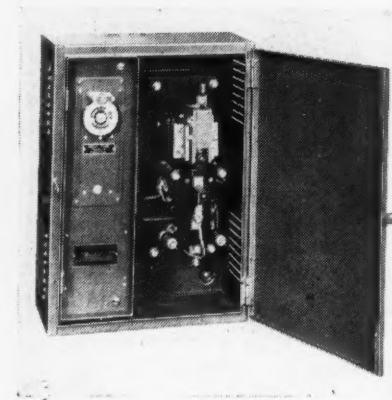
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Company _____

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City _____ Zone _____ State _____

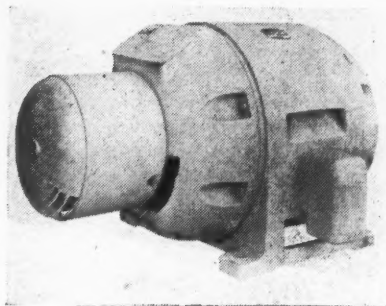
Equipment News



Welder Controller

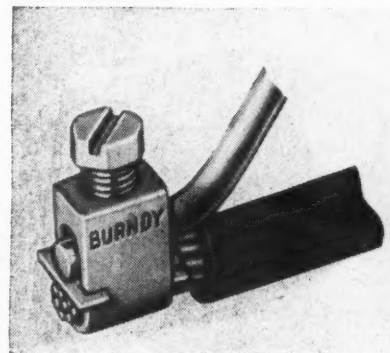
The new Class 8992 Type BBG-1 combination controller provides complete electrical control for a small foot or motor operated resistance welding machine. The single enclosure contains a NEMA 1A pneumatic weld timer, a size 1W, 100 ampere, high speed magnetic welder contactor and a control transformer. Initiating switch and control circuits, operated at 110 volts, isolated from power supply. Timer is mounted on a Safront swingout panel with adjusting dial on front and all energized parts in the rear. A dual primary control transformer may be connected for 110, 220 or 440 volts 60 cycles, or for 380 volts 50 cycles. Square D Company, 4041 N. Richards Street, Milwaukee 12, Wis.

It operates by momentum of starting current and responds to open the starter winding circuit between 1400 and 1500 rpm. as the current drops. Fitch, Allen & Company, 1131 Bryn Mawr Avenue, Chicago 40, Ill.



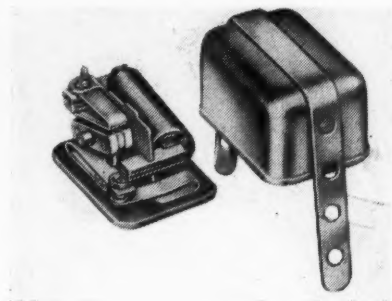
Motors and Generators

A new line of general purpose, Tri-Clad, high speed synchronous motors and generators in "900 series" frame size, has been announced. They are available in standard ratings from 20 hp. to 1,000 hp. at 60 cycle speeds of 514 to 1800 rpm, in either two phase or three phase types. Generators are available in ratings from 12½ to 1250 kva. Of drip proof construction, motors incorporate usual Tri-Clad features. Direct connected and belt driven exciters are available for all ratings. General Electric Company, Schenectady 5, N. Y.



Connectors

Copper and aluminum conductors can now be connected at service entrances by means of a new Buttin. The tin-plated copper alloy body makes it suitable for both aluminum and copper. A pressure bar, also tin-plated, prevents contact of dissimilar metals and distributes the screw pressure so as to minimize cold-flow of aluminum conductors placed beneath it. Only one connector type is needed to connect every possible combination of service entrance wire—copper to copper, copper to aluminum, aluminum to aluminum, and aluminum to copper. Burndy Engineering Company, Inc., 107 Bruckner Blvd., New York 54, N. Y.

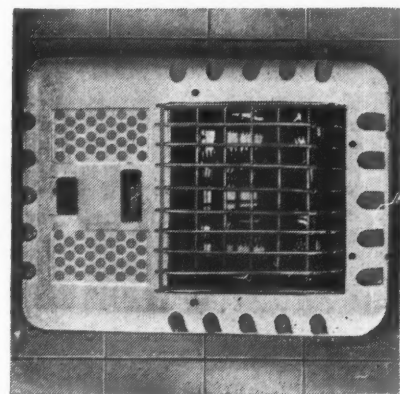


Switch

This new type universal motor starting switch can be used to start single phase, split phase, or capacitor start, 90 to 130 volt, 50/60 cycle motors, ranging from ¼ to ½ hp. rating. Enclosed in cadmium-plated brass case, switch is designed for quick external or internal mounting and is provided with flexible slotted metal straps. Overall dimensions are 1½ inches wide by 1½ inches long by 1 inch high. Mounting strap measures 6 inches from end to end. Switch is connected in series with working winding of any type motor.

Motor

A sanitary motor for use in dairies, food process, canning and beverage plants, has been developed. Unit is streamlined, and free of cracks, recesses or depressions where milk or food products can collect. Smaller ratings are supplied in totally enclosed, non-ventilated construction. Larger ratings are splash-proof and supplied with removable grille plates over cooling air inlets and outlets. Base is enclosed by motor housing which is finished to a flat surface. Mounting bolt holes are located in accordance with NEMA standards, permitting motor to be interchangeable with motors in use. Base design permits the use of a built-in conduit box. Conduit may be brought into motor through side or bottom of motor housing. For vertical shaft or flange mounted applications, a round frame, non-ventilated motor of streamlined design will be supplied with a conduit box built into end bracket of motor. The Louis Allis Co., Milwaukee 7, Wis.



Infrared Heater

A new infrared wall heater has been announced. It has a rated capacity of 1600 watts and is available in two models, operating on either 110-120 or 220-230 volts. A high volume, non-turbulence creating fan drives the heat out of the case through ducts, keeping the case "Ever-Cool." Front panel measures 10 by 14 inches; wall box 3 by 9 by 12½ inches. It is listed under the Re-Examination Service of Underwriters Laboratories, Inc. Titan Manufacturing Co., Inc., Buffalo 2, N. Y.



Fittings for

- Thinwall Conduit • Rigid Conduit • Metallic and Non-Metallic Cable • Flexible Steel Conduit • Service Entrance Cable • Grounding Devices • Lighting Fixture Fittings
- manufacturers for over 30 years

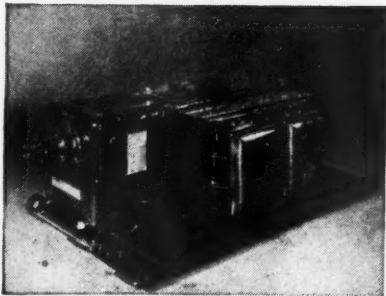
Sold Through Electrical Wholesalers
representatives in principal cities

midwest electric mfg. co. • 1639 walnut st. • chicago 12, ill.



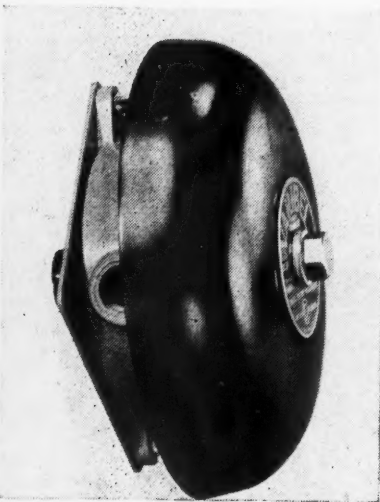
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Mine Power Center

A three-phase, portable, explosion-proof, electric power center for low height, underground mine service has been announced. It is designed with both high and low voltage plugs and receptacles. Core and coils are hermetically sealed in a case filled with dry nitrogen providing protection from explosion, dirt, falling objects, corrosive fumes, or moisture. All operating parts are enclosed in an explosion-proof aluminum case. A safety circuit center on the low voltage side rated "permissive" provides complete protection and control. Center is equipped with two, three, or four type AB circuit breakers depending on number of low voltage circuits to be used. Sizes of 75, 100 and 150 kva. are available for three phase, 60 cycle, high voltages of 2400, 4160, 4800 and 7200 volts. Transformers are skid mounted. Westinghouse Electric Corp., Pittsburgh 30, Pa.

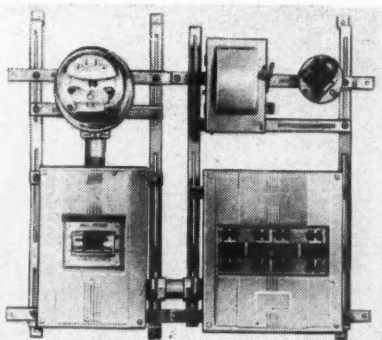


Industrial Bell

A single stroke electric industrial bell, known as Fedrabel, is now available. It is an underdome type of gong. Weatherproof models have a gasketed mechanism enclosed in a non-corrodible housing. Mounted with plunger down, they shed water and automatically drain condensation. For interior use, they are available with a "plug-in" feature, which will fit any standard outlet box. Federal Enterprises, Inc., 8700 South State Street, Chicago 19, Ill.

Solenoid

A new small space, alternating current solenoid, equipped with standard duty coils, has been announced. It is recommended for heavy duty service on valves located where ambient temperatures are high, such as near boilers. It is for continuous duty 60 cycles or intermittent duty 50 cycles. B/W Controller Corporation, Birmingham, Mich.



Meter Board

A new all steel universal meter board and meter mount has been announced. Single unit installation has meter socket and panelboard mounted in position. When placing panels in remote position, panelboard is replaced with either main break or fused switch. Another model has switch and control equipment mounted in position. Gang type installation has meter socket, main break, breaker panel, furnace control switch and low voltage transformer mounted in position. Gang type is furnished in five sizes to accommodate any type of equipment and can be continued to any length required. Robinson-Black Corp., 10 West Pearl Street, Cincinnati 2, Ohio

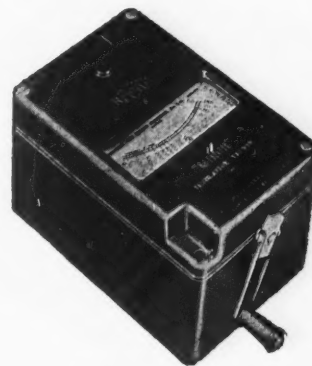
Instrument

A multi-combination meter, designed specifically for electrolysis and corrosion investigations and cathodic protection testing both in field and laboratory has been developed. By use of a circuit selector switch, a high-sensitivity, 300 ohms-per-volt milli-volt/voltmeter covering ranges of two millivolts to 100 volts, full scale, and a high-sensitivity, 62,500 ohms-per-volt voltmeter with ranges of 100 millivolts to 20 volts full scale, are provided. Either may be used separately or both may be used simultaneously. Also provided are a potentiometer-voltmeter with a high-resistance calibrated galvanometer, a vacuum tube voltmeter which is battery operated with ranges from 100 millivolts to 10 volts with 500,000 ohms input resistance; milliammeter and ammeter with full scale ranges of 1 milli-ampere to 20 amperes; and a zero-resistance type ammeter from self contained batteries and controls. M. C. Miller, 1142 Emerson Ave., W. Englewood, N.J.



Test Set

This wiring inspector's test set has been developed to enable one person to make a complete test of the wiring in any building without additional help. It is housed in a gray fiber carrying case measuring 14 $\frac{1}{8}$ by 7 $\frac{1}{8}$ by 9 $\frac{1}{8}$ inches high. A compartment provides storage space for flexible leads and portable meter. Power is supplied from standard 6 volt dry cell. Eastern Specialty Co., Philadelphia, Pa.



Instrument

A new Megohmer insulation tester, known as "Minor," has been announced. The size is 5 $\frac{1}{4}$ by 3 $\frac{1}{4}$ by 3 $\frac{1}{4}$ inches. The instrument is of the hand crank type, having a d-c generator with a 500 volt d-c output. Measuring system is of the ohmmeter cross coil type, which gives direct readings independent of generator speed. Scale has a range of 0-50 megohms and infinity. Case is burr walnut bakelite, and comes with a leather carrying case, set of six foot test leads and 50 megographs for recording insulation resistance measurements. Herman H. Sticht Company, Inc., 27 Park Place, New York.

Fluorescent Fixture

A new glass shielded, single lamp fluorescent fixture for commercial and residential use has been introduced. Known as Peabody CSG-120 and CSG-140, the new units are built around the basic unshielded single lamp 20 watt and 40 watt utility fixture, to which ribbed, opaque glass diffusing panels and end caps

THE AIR YOU BREATHE SHOULD BE AS PURE AS THE WATER YOU DRINK

Exclusive ILG self-cooled motor



VENTILATION

The match flame demonstrates how this patented ILG Motor cools itself with outside air! It's engineered to operate at peak efficiency in the contaminated air stream of an exhaust fan.

When fan is operating, clean, cool, fresh air is drawn through vent pipe from outside—circulated through motor, then exhausted from front of motor. Motor stays clean, cools itself—no foul air reaches it to interrupt service, shorten its life. It's tested. It's proved. It makes sense. Get complete details from your nearby ILG Branch Office (consult classified directory) or send coupon for free copy of new ILG Condensed Catalog and Data Book.

FREE! 48-page booklet showing solutions to wide range of ventilating problems. Send coupon for No. 544.

ILG ELECTRIC VENTILATING CO., 2879 No. Crawford Ave.
Chicago 41, Ill., Offices in more than 40 Principal Cities

☐ Send free copy of new Condensed Catalog and Data Book

Firm Name _____

Individual _____ Title _____

Address _____ Zone _____

City _____ State _____



with medallions have been added. They can be used as individual fixtures in small areas, or mounted end-to-end in continuous rows for general space lighting in small stores, offices, corridors. For "Perimeter" lighting, right angle bends are possible by attaching a curved fitting. Sylvania Electric Products, Inc., New York, N. Y.



Pushbutton

A new type HLS reset locking pushbutton for nurses' bedside calling stations has been added to this line. It has a red translucent push (end), a shockproof plastic front section and polished metal end bell. The completed pushbutton assembly is adapted to all button call systems now in general use in hospitals. It has 5-contact plug end, with eight feet of flexible non-twisting rubber cord. To summon a nurse, button is released, buzzer stops, although all lights in the system remain lighted until nurse responds to call and resets button at patient's station where call originated. Cannon Electric Development Company, 3209 Humboldt St., Los Angeles 31, Calif.

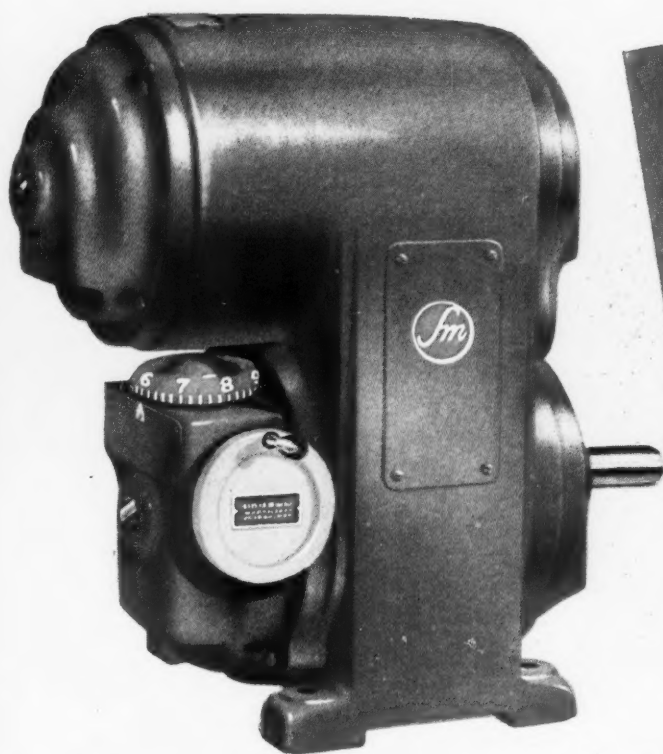


Meter

A new watt-hour meter designed as Type I-50, featuring magnetic suspension of the rotating element, has been announced. The "floating disk" consists of two concentric magnets of cunco, a high-coercive material, which have been placed one within the other. The outer magnet is attached to the meter frame, the inner

For more profitable production

VARIABLE SPEEDS



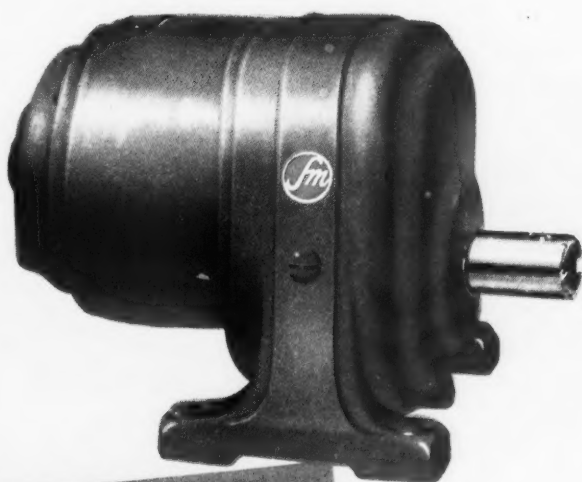
MEET PRODUCTION "VARIABLES"

Fingertip speed control provides positive power at the correct production speed—faster or slower. Improved Sterling Speed-Trol gives you infinite speed control in a single, rugged, dependable power unit occupying one half the space formerly required—fits standardized motor mounting—incorporates V-Belt and proven engineering principles.

Improved **STERLING SPEED-TROL**

SEND FOR NEW INFORMATIVE LITERATURE

SLOW SPEEDS



USE GEARED CONSTANT SPEED

There is no other known method of obtaining constant slow speed that is more efficient or economical in operation than this improved Sterling Slo-Speed motor. Sterling Slo-Speed motors with gears, motor and all parts, Sterling made into one rugged, compact unit, will give you long, dependable service at the "one best" constant production speed.

Improved **STERLING SLO-SPEED**

SEND FOR NEW INFORMATIVE LITERATURE



Where constant normal speed is required, use the improved Sterling KLOSD; KLOSD-TITE FAN-COOLED; KLOSD-TITE ENCLOSED; KLOSD-FACE-MOUNTED electric power drives.

Thousands of satisfied, world-wide users are increasing plant profits with Sterling Speed-Trol and Sterling Slo-Speed motors.

STERLING ELECTRIC MOTORS

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Canadian Sterling Electric, Ltd., Hamilton, Ontario, Canada
Representatives in Principal Cities and Foreign Countries

*for safety,
durability
and
LONG LIFE...*

LOOK FOR THE NAME
ILLINOIS
BEFORE YOU BUY!

USE ILLINOIS ALL PORCELAIN WIRING SYSTEMS

Play safe with Illinois. Its top quality is assured by rigid production control standards faithfully maintained by craftsmen with long years of training and experience. From the exacting task of selecting

materials, through all steps leading to the finished product, constant inspection and extreme care combine to bring you the best in porcelain wiring systems.

PORCELAIN WIREHOLDER INSULATORS



Illinois dry process wireholders are uniformly made to highest specifications in sufficient styles and sizes to meet all requirements. Smooth, rounded surfaces protect wire insulation. Deep, sharp screw threads assure easy and firm installation. Non-shrinking metal alloy permanently binds screws to insulators. All-steel screws are protected with smooth, even coating by special galvanizing process. No rust streaks on sides of buildings. Wet process porcelain supplied on special order.

ALL PORCELAIN ILLINOIS SYSTEMS

For outstanding, adequate and modern wiring jobs, for every building wiring plan, use reliable, economical Illinois systems. From the entrance switch to the last outlet, porcelain systems are easily and quickly installed, insuring permanency and the utmost safety. Especially recommended where moisture or extreme temperatures are factors. Rust and corrosion resistant.

STANDARD TUBES

Glazed, unglazed, split, floor, split floor, headless, curved, crossover split, and crossover. Uniform inside and outside diameters. Sizes 1/2 to 48" long, 5/16 to 3" diameter.



Firm grip knobs that don't chip when installed. Cement coated, extra length nail — genuine leather washer — code standard. Wide variety of heights, diameters, holes and grooves.

CLEATS

Standard cleats of all sizes and types.



ILLINOIS
ELECTRIC PORCELAIN CO.

MACOMB, ILLINOIS

magnet to the upper end of the disk shaft. The interaction of the two magnetic fields supports the rotating system at a small downward displacement. Other features are new electromagnet with polyethylene plastic and butyl rubber insulations; a new and stable damping system; a one-piece, unit molded base as an insulation between conductors; pointer type and cyclometer type registers of unit construction; unit construction of components and corrosion-resistance. General Electric Company, Schenectady, N. Y.

Silver Plater

This portable heavy duty silver plater is for all electrical requirements on construction, maintenance, repair or production work. It handles all sizes and shapes of busbars, switches, fitting, etc. Coatings are silver. Plater consists of plating rectifier, 16 ampere, 0-8 volts, for use on 110 volt, 60 cycles a-c. Complete with ammeter, rheostat, wires, handle, in steel case. Coating tester for shop tests; polishing block; 16 fl. oz. metal cleaner; 16 fl. oz. silver electrolyte; silver applicator. Rapid Electroplating Process, Inc., 1414 S. Wabash Ave., Chicago 5, Ill.

Motor Capacitor

A new Pyranol motor capacitor, designed to withstand the same physical treatment as the motor itself, has been announced. Available in all popular ratings, capacitor is enclosed in 10 gage steel tubing. Bushings are of silicone, the new rubber-like material that seals permanently by compression without gaskets or stickers, and is impervious to oils, acids, and alkalis. Steel mounting bracket is spot-welded to capacitor enclosure. Long Flamenol leads are protected by insulating eyelets where they pass through enclosure and are unaffected by baking heat, oil, water, or mild acids. General Electric Co., Schenectady 5, N. Y.

Electronic Radio Alarm

A new electronic radio alarm, Model HS-5, has been announced. It is an electronic device which detects intrusion by a change in antenna capacity. It also detects fire by means of a built in heat detector set to operate at approximately 160 degrees F. Instrument is basically a balanced electronic capacity bridge, in which external antenna system is balanced against internal capacity. One of the features of the instrument is a special circuit by means of which very slow changes in capacity over long periods of time, such as caused by snow, rain, hail, and other weather conditions will not set off an alarm. El-Tronics, Inc., Philadelphia, Pa.

BENDIX-SCINTILLA

the finest ELECTRICAL CONNECTORS

money can build or buy!

SHELL
High strength aluminum alloy... High resistance to corrosion... with surface finish.

CONTACTS
High current capacity... Low voltage drop.

SCINFLEX ONE-PIECE INSERT
High dielectric strength... High arc resistance.

AND THE SECRET IS SCINFLEX!

Bendix-Scintilla* Electrical Connectors are precision-built to render peak efficiency day-in and day-out even under difficult operating conditions. The use of "Scinflex" dielectric material, a new Bendix-Scintilla development of outstanding stability, makes them vibration-proof, moisture-proof, pressure-tight, and increases flashover and creepage distances. In temperature extremes, from -67°F. to $+300^{\circ}\text{F.}$, performance is remarkable. Dielectric strength is never less than 300 volts per mil.

The contacts, made of the finest materials, carry maximum currents with the lowest voltage drop known to the industry. Bendix-Scintilla Connectors have fewer parts than any other connector on the market—an exclusive feature that means lower maintenance cost and better performance.

*REG. U.S. PAT. OFF.

Write our Sales Department for detailed information.

- Moisture-proof, Pressure-tight • Radio Quiet • Single-piece Inserts
- Vibration-proof • Light Weight • High Arc Resistance •
- Easy Assembly and Disassembly • Less parts than any other Connector

Available in all Standard A.N. Contact Configurations

**BENDIX
SCINTILLA**

SCINTILLA MAGNETO
SIDNEY, N. Y.
DIVISION OF

AVIATION CORPORATION

McGILL* PORTABLE LAMP GUARDS

NOW BUILT WITH . . . NEW No-Rol CAGE



No. 7000SR Portable Lamp Guard has the No-Rol cage made of zinc plated wire. Handle of moulded rubber features LEVOLIER Switch. Lamp Size — 40-100 W.

It's the latest development in portable lighting . . . designed to prevent rolling of the lamp guard after the light is trained on your work. Safety is also increased because the eared cage reduces "dead bulb" damage caused when portables roll from work tables and sever bulb filaments.

Numerous other advantages result from this new design improvement that provides for extended corners on the otherwise rounded cage exterior.

The No-Rol feature is your guide to better portable lighting . . . insured by the complete McGill line of lamp and wall guards designed especially to meet every requirement.

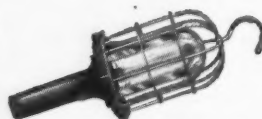
Send today for McGill Catalog No. 43 so you can pick out the lamp guard that most effectively solves your problems.

* TRADE MARK

McGILL

Electrical Division

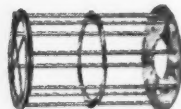
450 N. CAMPBELL ST., VALPARAISO, INDIANA



No. 3005 Vaporproof Guard has a heavy brass wire cage with sealed Insurok handle and air and moisture proof globe that is heat and impact resistant. Lamp Size — 100W.



No. 4675 uses solid polished Birch wood handle. LEVOLIER Switch. Cage of zinc plated heavy steel wire. Lamp Size—25-100W.



No. 1440 Wall Guard for protection of bulbs exposed to theft and damage.



McGill extra quality Soldering Paste and Sticks, Coloring Fluids and Insulating Compounds.

New Equipment Briefs

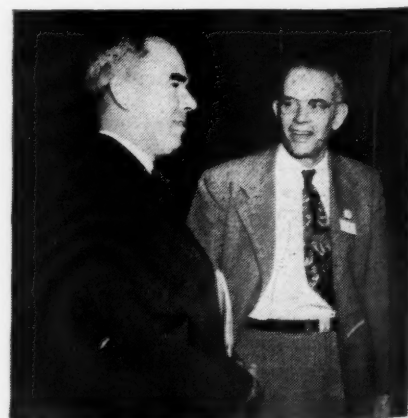
A new synchronous differential has been developed by the Square D Company's Kollsman Instrument Division, Emlhurst, N. Y. . . . Speedway Manufacturing Company, Cicero, Ill. has announced a new $\frac{1}{4}$ horsepower bench grinder. . . . The "Super-Value" commercial fluorescent fixtures, available in two and four 40 watt models, has been announced by Mitchell Manufacturing Company, Chicago, Ill.

The Wheeler Insulated Wire Company, Waterbury, Conn. is manufacturing a self-powered telephone, especially designed for applications where power supply is unavailable or uncertain. . . . New E-Z code identification markers are now individually mounted on a new speed tab for faster and easier applications. They are made by Western Lithograph Company, Los Angeles, Calif.

Union Insulating Company, Inc., Parkersburg, W. Va. has developed a new porch light that is dust and vapor proof. . . . A line of syncro units designed for electronic, electromechanical and electrohydraulic control systems has been announced by Arma Corporation, Brooklyn, N. Y. . . . A new high voltage, outdoor, frame mounted oil circuit breaker has been announced by Allis-Chalmers, Milwaukee, Wis.

The Minerallac Electric Company, Chicago, Ill. has announced the addition of two new products—two-hole pipe straps of zinc plated steel and perforated strap of electro-galvanized steel. . . . Type TP and TS industrial timers have been developed by the Montgomery Mfg. Co., Chicago, Ill. . . . W. H. Long Co., Chicago, Ill. has developed all weather, outside fluorescent lights. The "Post-Lites", installed on pipe posts, have eight 40 watt tubes, and "Half-Lites", for pillars or walls, have four 40 watt tubes.

The Chase-Shawmut Company, New-



Alfred Elson, Jr., New England Machine & Electric Co., Pawtucket, R. I.; William S. Giles, Giles Armature & Electric Works, Inc., Marion, Illinois.

Save with modern distribution systems using **WESTINGHOUSE** Dry-Type Transformers

If you are expanding or relighting your plant, you can lower operating costs and gain greater efficiency feeding motors and lights by using a modern distribution system.

In such a system, higher voltages are brought close to the load and are stepped down at the motors and lights they serve with modern, dry-type transformers.

You will:

**GET BETTER REGULATION
SAVE COPPER
SAVE INSTALLATION COSTS
REDUCE OPERATING EXPENSES**

And Westinghouse dry-type transformers will give you additional advantages of **SMALL SIZE AND LIGHT WEIGHT**, important to the men who actually install the transformers.

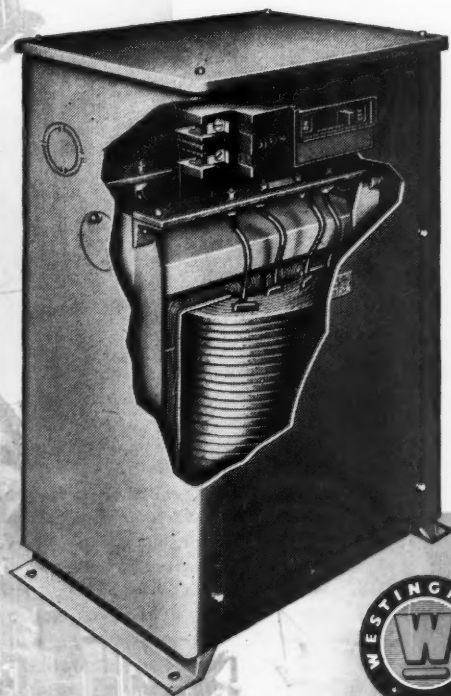
To get these extra "plus" advantages, Westinghouse leadership in engineering introduced Class B insulation and developed HIPERSIL*, the steel that carries one third more magnetic flux.

That same engineering is ready to assist you with the proper application of dry-type transformers in the distribution system best suited to your needs. Call or write your near-by Westinghouse office for your copy of Booklet B-4009. Westinghouse Electric Corporation, Transformer Division, Sharon, Pennsylvania.

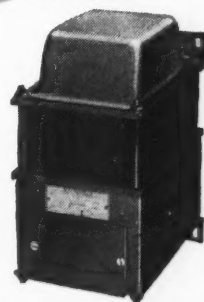
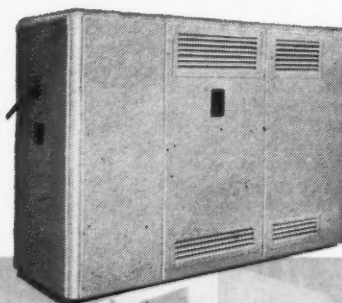
J-70517

*Reg. U. S. Pat. Off.

**YOU CAN BE SURE
IF IT'S Westinghouse**



A NEW FEATURE—Two popular dry types, AJR and AVR, are now offered with or without a built-in circuit breaker. With this new feature, the need for separate protective devices is reduced. AVR-B (with breaker) is shown at left.



ABOVE—Type GP which, with type MT, are small, class A insulation transformers serving loads under 2 kva.

LEFT—Dry-type power center, used indoors as part of modern industrial distribution.



Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

**"LEADERSHIP IN TRANSFORMER DEVELOPMENT
... FOR EVERY POWER DISTRIBUTION JOB"**



Now!

An Adequate Supply STEEL CITY Malleable Iron CONDUIT FITTINGS .. of most wanted types & sizes.



You make a friend

when you recommend

STEEL CITY

ELECTRIC CO.

OUTLET BOXES AND COVERS
JUNCTION BOXES, CONDUIT FITTINGS AND ELECTRICAL SPECIALTIES

SWITCH AND FLOOR BOXES
JUNCTION BOXES, CONDUIT FITTINGS AND ELECTRICAL SPECIALTIES

COLUMBUS AVE., PITTSBURGH 12, PA.

buryport, Mass. has announced a new T-D (time delay) link for renewable ferrule-type fuses. . . . A new electrical wire X, "Laytex RUW", with rubber insulation that improves when soaked in water has been developed by United States Rubber Company, New York, for wiring homes, factories, office and other buildings.

A line of induction motors and generators designed specifically for high performance servo and instrumentation applications has been announced by Arma Corporation, Brooklyn, N. Y. . . . A new 150 ampere welder, known as Sureweld, is being manufactured by D. W. Onan & Sons, Inc., Minneapolis, Minn. . . . A new booster amplifier for use with intercom and sound systems has been announced by Executon, Inc., New York, N. Y.

Mitchell Manufacturing Company, Chicago, Ill. has announced three new streamlined "Zoom-Lights" for high-lighting interiors, merchandise and displays. . . . A new thread cleaner has been announced by the Buckingham Manufacturing Co., Inc. of Binghamton, N. Y. . . . Allied Electric Products, Inc. of Irvington, N. J. has announced a new spring-action adjuster for realigning lampholders in old and new fluorescent fixtures.

Newly designed Series PAC, synchronous motor driven, instantaneous reset timer has been announced by Industrial Timer Corporation, Newark, N. J. . . . A new portable reel, called the Powereel, is designed to house up to 300 feet of $\frac{3}{4}$ inch, No. 12, four conductor cable or equivalent. It has been developed by the Industrial Electrical Works of Omaha, Nebraska.

Holub Industries, Inc., Sycamore, Ill. has developed "Hi" carbide tipped masonry drills. . . . Gold E. Manufacturing Co., has introduced a new 100-105 watt Hi-Liter spotlight for use in windows, counters, exhibits and displays. . . . A new type of inorganic electrical insulation, known as "quinterra", has been announced by Johns-Manville, New York.



In a huddle at a recent Electrical Maintenance Engineers Association meeting in Pittsburgh are: (L to R) C. R. Black, maintenance supervisor, Westinghouse Electric Corp., Pittsburgh; R. L. Ringler, electrical shop supervisor, Carnegie-Illinois Steel Corp., Clairton, Pa.; H. P. Rambo, maintenance representative, Westinghouse; and M. J. Monasky, Carnegie-Illinois Steel Corp.

POWER YOU NEED...

Where you need it When you need it

• Electrical power is becoming more and more important in modern production methods. It's needed in larger amounts at many and varying locations dependent upon shop layout and machine arrangement. Square D's Feed-in and Plug-in Duct are a combination with an outstanding performance record in hundreds of plants throughout the country. Feed-in Duct handles heavy loads characteristic of large feeder circuits with high efficiency and low voltage drop. Plug-in Duct permits protected branch circuit "take-offs" at frequent intervals along the length of the duct.

moisture and resistant to arc. Surge clamps (D) every 24" give structural and mechanical strength necessary to withstand 50,000 ampere "shorts." Steel channels (E) complete the housing.

SQUARE D FEED-IN DUCT—heavy power feeder with lowest known voltage drop characteristics. Exclusive design requires no ventilation for limiting temperature rise—permits completely enclosed, dust-excluding structure. Rigid construction resists heavy electrical stresses. Absence of all-metal enclosure eliminates "hum" and iron losses.

SQUARE D PLUG-IN DUCT—for flexible power distribution to branch circuits. Round bus bars provide greater mechanical strength and resistance to short circuit stresses. Steel enclosure and rotating doors over plug-in openings exclude dust and dirt.

A quick glance tells you what Square D Feed-in and Plug-in Duct do. It takes a closer look to learn how they do it and why they do it better. Your nearby Square D Field Engineer will be glad to give you the complete story. Or write for detailed information.

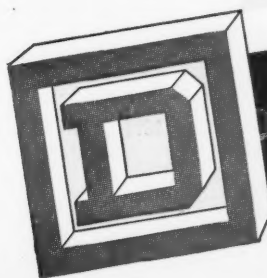
Address: Square D Company, 6060 Rivard St., Detroit 11, Michigan.

"One-split" bus (A), with halves positioned on either side of other two busses, permits close spacing and electrical symmetry important to reduction of both energy loss and voltage drop.

Solid ebonized asbestos insulating plates (B) and (C) which totally enclose bus, have great mechanical and high dielectric strength, conduct heat readily, are impervious to

Plug-in units are easily attached. Powerful contact jaws, affording positive pressure, can be "rocked" into position on bus bars.

Five units may be attached to either side of each ten-foot section. Flexible couplings join Plug-in bus bars—absorb expansion or contraction and eliminate section alignment problems.



SQUARE D COMPANY

DETROIT

MILWAUKEE

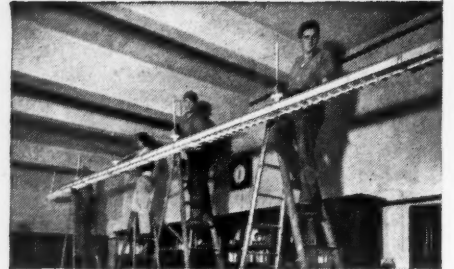
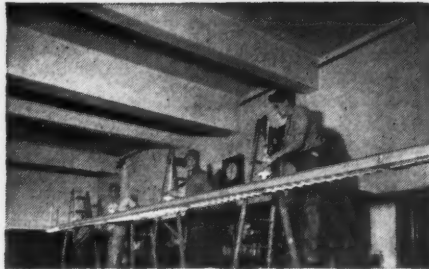
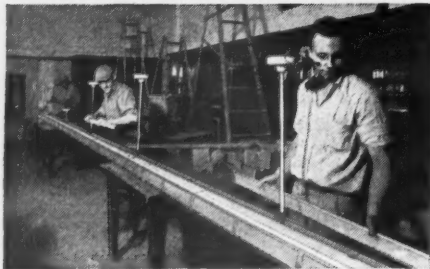
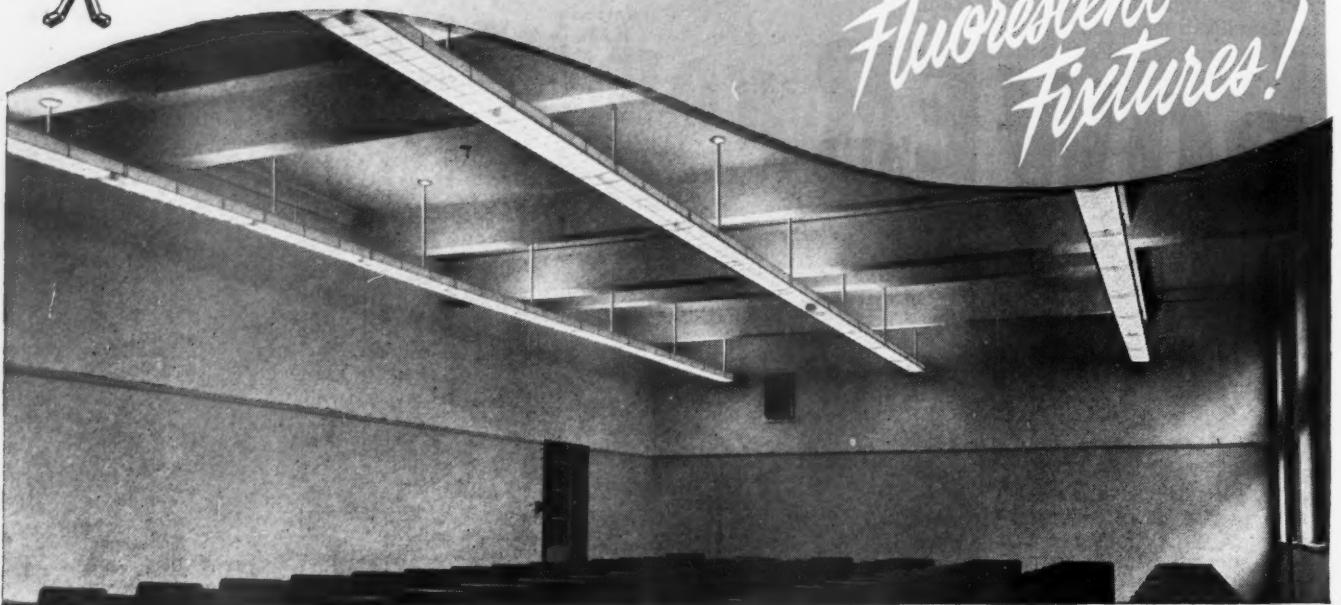
LOS ANGELES

SQUARE D CANADA, LTD., TORONTO, ONTARIO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.



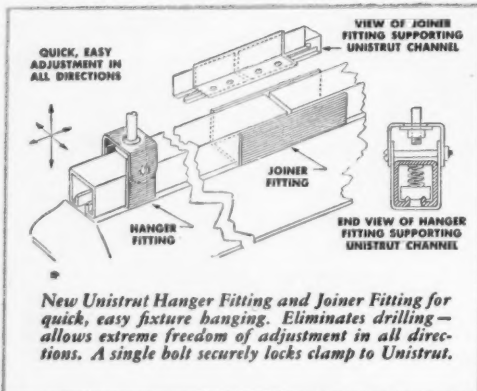
There's no better way to suspend

*Fluorescent
Fixtures!*



Photographs illustrate the ease and speed with which fixtures are assembled to Unistrut at normal working height, then raised as one unit for suspension. Three minutes after picture at extreme right was taken, installation had been completed.

Installed by Wadeford Electric Co., Chicago, at Oak Park Township High School, Oak Park. Consulting Engineers—Neiler, Rich & Bladen, Chicago. Fixtures by Curtis Lighting Inc., and F. W. Wakefield Brass Co.



4 *reasons why*

"UNISTRUT"
ALL-PURPOSE METAL FRAMING

makes fixture hanging easier and results in a better installation

1 FEWER HANGER RODS

Hanger rods may be spaced as far as 15 feet apart, resulting in lower costs and a better appearing installation.

2 PERFECT ALIGNMENT

Unistrut is perfectly rigid and straight—results in true alignment of fixtures. Standard lengths 10 and 20 ft.

3 FASTER, EASIER INSTALLATION

Entire run of fixtures can be quickly assembled to Unistrut *before* raising completed unit to ceiling for suspension.

4 COMPLETELY FLEXIBLE

Hangers may be installed at *any* point along Unistrut continuous slot channel. Allows greater adjustment—easier alignment and leveling of fixtures.

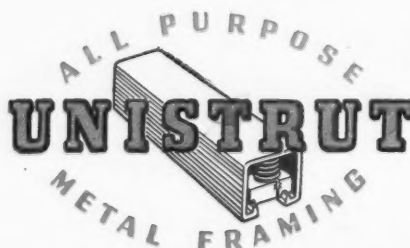
Unistrut has hundreds of other uses—completely adjustable and 100% re-usable!



Send for Pamphlet No. 91
"Unistrut Method of Supporting
Fluorescent Lighting Fixtures"

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CHICAGO 7, ILLINOIS

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City _____ State _____



Representatives
in all Principal Cities

PRODUCTS COMPANY

1013 W. WASHINGTON BLVD., CHICAGO 7, ILL.

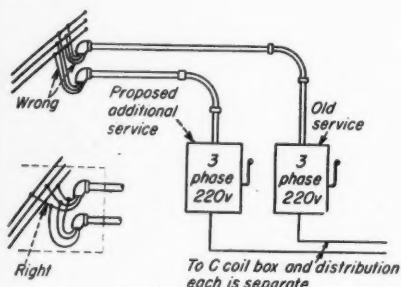
Answered by
F. N. M. SQUIRES
Chief Inspector
New York Board of Fire Underwriters
New York, N. Y.

and
GLENN ROWELL
Electrical Engineer
Fire Underwriters Inspection Bureau
Minneapolis, Minn.

Questions on the Code

Service Drops

Q. Where an increase in a service is to be made, would the code permit a second service to be installed as per sketch; in a plant, bakery, department store or manufacturing business?



According to section 2321, this would not be permissible unless 2321-c., Capacity Requirements, would permit it.—B.R.

A. In the case referred to, the National Electrical Code would not permit two service drops from the street supply line to the building, but it would permit the two sets of service entrance conductors running down or along the outside of the building from the one service drop to the points of service entrance to be connected to one service drop run from the street line to the building.—F.N.M.S.

Wiring A School Building

Q. Is it permissible to use non-metallic sheathed cable for the wiring material in a rural school building?—O.D.

A. The National Electrical Code would permit the use of non-metallic sheathed cable within a school building without an auditorium. If the school contains an auditorium having a seating capacity of more than 100 persons, an electrical inspector would be justified in requiring a metallic raceway system for that portion as it is quite common practice to use

school auditoriums for public showing of motion pictures or plays and under such conditions it might be considered as either a theatre or a motion picture studio. This is another instance where personal judgment by the inspector having jurisdiction is involved so he should be consulted before definite plans for the wiring installation are completed.—G.R.

Motor Circuits

Q. In a large open area machine shop I plan to run the motor feeder circuits in conduit suspended directly below the roof truss which is from 20 to 32 feet above the floor. The motor circuits will be dropped from junction boxes on these feeder conduits directly to each motor. I had planned to provide the motor circuit fuse protection within the disconnecting switch which would be located about six feet above the floor on building columns or on panels used for the motor control equipment. Now the question arises of the size of the individual motor circuit wires. Can they be smaller than the feeders even though they are not provided with fuses at the feeder taps?—H.R.

A. Yes, provided they have current carrying capacity of at least 1/3 that of the feeders and are not more than 25 feet long and are protected against mechanical injury. This permission will be found under Section 4348 of the National Electrical Code.—G.R.

Concealed Splices

Q. I made a change from concealed knob and tube to armored cable in compliance to section 3007 of existing code, and the inspector rejected this wiring as the taps made to existing concealed wiring were not accessible, and must remove old fixture and old wooden fixture support to install

an outlet box and make joints in them so they will be always accessible, I have been installing this type of wiring for years and was always accepted. Is this inspector right or have the others been wrong?—L.J.E.

A. Section 3008, of the National Electrical Code, requires that a box shall be used wherever a change is made from armored cable to concealed knob and tube work and Section 3718 requires that junction boxes shall be readily accessible.

Note that Section 3008 permits the use of a terminal fitting having a separate bushing hole for each conductor, where a change is made from conduit, electrical metallic tubing, non-metallic sheathed cable, armored cable and surface metal raceway to open wiring or to concealed knob and tubing work, but that such a fitting must not contain taps or splices.

As splices would be required in going from armored cable to knob and tubing work un-enclosed splices would not be permitted. Therefore, a box would be required and it could not be concealed.—F.N.M.S.

Conductors

Q. What kind of insulated conductors must we use for the lighting of an outdoor automobile sales lot? The area to be lighted is about 110 by 200 feet and is located next to the garage building. The owners want continuous light strings running the length of the lot.—F.B.

A. The Code requires the use of rubber covered or thermoplastic insulated conductors for festoon lighting. This will be found under Section 7313 of the Code. Then under Section 7321-b you will note that where the span for festoon lighting exceeds 40 feet, the conductors must be supported by means of a messenger wire supported by approved strain insulators.—G. R.

G. E.'s New Electric Heater is easily built right into wall!

For Old Houses . . . for New Houses!

Here's one of those extra, inexpensive luxury features that people look for when they're buying a house.

It's a Built-in Electric Wall Heater, manufactured by the General Electric Company—a wonderful selling feature for any house, old or new.

It was designed with the bathroom in mind, but is installed easily in any room in the house.

Complete, this heater makes any bathroom, any room look more modern. With the snap of a switch, it circulates heat throughout the room by the radiant-convection principle.

And for a very little bit extra, a remote control switch can be attached,



so that the heater can be turned on from the bedside or from another room.

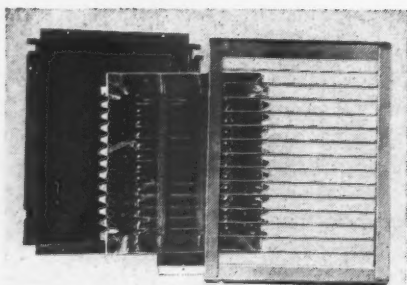
Specifications for General Electric Built-in Wall Heater

1. Comes completely equipped with tumbler switch as integral part.
2. Beautiful Hammertone gray finish—can easily be painted another color.
3. Fits flush with wall—guard projects only $\frac{5}{8}$ of an inch.
4. Highly polished corrugated-aluminum reflector that radiates heat in wide zone.
5. Protective grille of high-quality-steel wire—easily removed for cleaning.
6. Two long-life heating elements of nichrome wire—ceramic cores.
7. Rating—1320 watts, 115 volts, a-c/d-c, 4507 Btu.
8. Size: $17\frac{1}{8}$ inches high by $13\frac{1}{8}$ inches wide by 4 inches deep. Wall opening, $14\frac{1}{4}$ by $11\frac{1}{2}$ inches.
9. Shipping weight, 10 pounds.

Amazingly low-priced



BUILT-IN ELECTRIC WALL HEATER



Heater consists of only three separate pieces: a wall box, heating assembly, and guard. Easy to install—instructions attached to each heater.

GENERAL  ELECTRIC

General Electric Co., Section 284-21
1285 Boston Avenue
Bridgeport 2, Connecticut

Please send me complete information
on General Electric's Built-in Wall
Heaters.

NAME.....

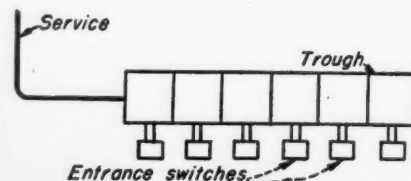
ADDRESS.....

CITY.....

STATE.....

Any Old Thing Don't Go

Q. I would like an interpretation in regard to the service equipment. Can any type of disconnect switch be used for entrance switch as shown below?—H.F.F.



A. Every type of disconnect switch cannot be used for a service.

A service switch (and there can be up to 6 of them) must comply with the following:

It must be manually operable see 2351a, 1st sentence.

It must be of a type approved for service equipment and for prevailing conditions,—2351a, last sentence.

It must be acceptable to the tenant whose service it controls.—2351b.

It must be manually operable with a handle or lever for mechanical operation by hand.—2354.

It must be indicating.—2355.

It must be externally operable.—2356.

It must be of proper rating.—2357.—F.N.M.S.

REA Wiring

Q. We are being called back to many of the farms we have wired in the past on the REA because the covering on the Romex is rotting off. These jobs were sold and installed in good faith and the owners in some cases feel that we are responsible. To replace these jobs without charging the farmer for either labor or material is out of the question unless the manufacturer will foot the bill. Then there seems little sense to putting the same kind of cable back if it too will fall apart within the next three to five years. The other day we heard about a new barn wire being used that will not be affected by the dampness found in dairy barns. Can you give us any further information? Is this wire approved by the Code?—H.H.

A. You no doubt have reference to the new neoprene jacketed cable now being produced by the Rome Cable Corporation under the trade name of "RoBarn" and the Anaconda Wire and Cable Company under the trade name of "Durall". These two companies are making this cable in

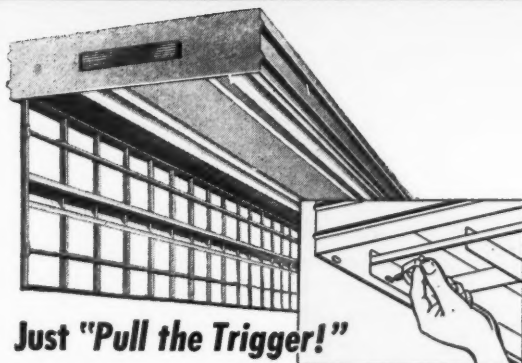
MITCHELL

Presents the NEW **"WAFER-THIN"**
ADVANCED DESIGN

4-40 Watt Louvered Fluorescent Luminaire

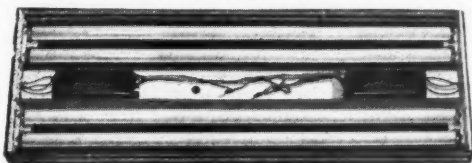


ALL-STEEL CONSTRUCTION
No Glass to Clean or Break
.....
TRIGGER-ACTION LOUVER
Swings Down on Either Side
.....
QUICK, EASY INSTALLATION
Easy to Clean and Maintain



EXCLUSIVE NEW HINGED LOUVER SWINGS DOWN ON EITHER SIDE

This exclusive new louver permits instant access for relamping or replacing starters. Ingenious spring trigger permits louver to swing down on either side or to be removed instantly for cleaning.



E.T.L. APPROVED BRICK-TYPE BALLASTS

Model No. 3032 comes complete with E.T.L. approved brick-type ballasts which assure better performance and less maintenance.

Incomparable Modern Beauty and Quality

This new MITCHELL "Wafer-Thin" Luminaire has slender, graceful lines designed to harmonize with both modern and traditional interiors. The new, exclusive louver design provides a modern note in lighting beauty combined with greater seeing comfort. Easy to clean and maintain because it is so simple in design. Ruggedly constructed throughout. All-steel body and louver completely eliminates undesirable glass breakage. With a single model, this unit is adaptable for every type of installation—suspension mounting, surface mounting, individually or in continuous rows. Vertical sides and ends permit all-around flush alignment to achieve desirable architectural effects and patterns.

Heavy gauge all-steel construction throughout. Sides and ends finished in Satin aluminum—louver finished in durable Baked White Enamel. Convenient knockouts are provided at top of channel for double stem mounting or for flush mounting to outlet box. With E.T.L. brick type ballasts, approved lampholders and starters. For 110-125 volts 60 cycle A.C. operation. Bears Underwriters' label. Model No. 3032 comes completely assembled, wired and ready to hang. Packed one to a carton.

Model No.	Shpg. Wt.	Description
3032	38 lbs.	4-40 Watt "Wafer-Thin" Fixture 49" long x 16" wide x 3 3/4" deep
032ST	4 1/2 lbs.	Double Stem Canopy Set 36" long 3/8" O.D

Send for Your MITCHELL POCKET CATALOG NO. 325!

Shows the Preferred Complete Lighting Line in one handy pocket book. It's the most effective Selling Guide ever prepared for the lighting trade! Write for it today.



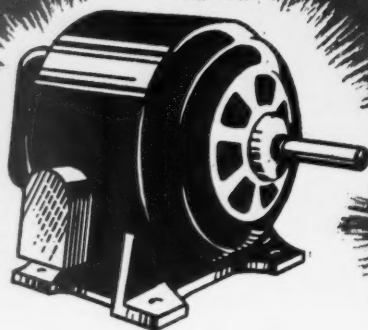
MITCHELL

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Mitchell Manufacturing Company

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In Canada: Mitchell Manufacturing Company, Ltd., Toronto, Canada
Far West: Complete Modern Plant and Sales Office at Los Angeles
Serves the Entire Pacific Coast Area
1019 NORTH MADISON AVENUE, LOS ANGELES 27, CALIFORNIA

THE PLUS FACTOR OF MOTOR PERFORMANCE



IS THE **OHIO** GENERATOR OR MOTOR **BRUSH!**

A motor is just as efficient as its brushes. Often an excellent motor is put into operation equipped with brushes selected for general use. However, atmospheric conditions, temperature and overloading impede efficiency and performance. Our engineers will gladly make the proper recommendations to increase motor efficiency with the use of the **proper** brushes. Look to "Ohio" for good performance in the Motor and Generator Brush Field.

Send for Our Reference Book in your category:—Industrial, General Purpose, Mining, Welding, Refrigeration, Appliances, Transportation, Carbon Specialties.

ORDER YOUR
CARBON BRUSHES
FROM A
SINGLE SOURCE



THE OHIO CARBON COMPANY

12508 BEREA ROAD • CLEVELAND 11, OHIO

two and three conductor cables in sizes 14 and 12 AWG. Neither cable has been approved by the Underwriters' Laboratories as yet, and the Code was written before they were developed so it contains no reference to them. However, this cable has been specifically designed for installation in buildings housing livestock. The dielectric value and impact resistance of its insulation is far better than that required for nonmetallic sheathed cable. The tensile strength of a two conductor No. 14 cable is slightly less than the minimum requirements for nonmetallic sheathed cable, but its resistance to corrosion is of so much more importance that it should far outweigh the slight lack of tensile strength. Several million feet have already been installed, and numerous tests have indicated that it is a very superior cable for use in buildings housing livestock as the corrosive conditions present have no apparent effect on the insulation.

This cable should not be used unless the authority having jurisdiction over electrical installations in your area or project has given specific approval for its use due to the fact that it has not as yet received the approval of the Underwriters' Laboratories.—O.R.

Circuit Protection

Q. *I have recently had an inspector reject one of my wiring installations because of my having a 15 amp. multibreaker on a special appliance circuit in a residence. This circuit was run with No. 12 wire to only one receptacle for the purpose of connecting a household refrigerator. This rejection was made because the breaker was not a 20 amp. breaker.*

Am I right in my opinion that the code specifies that the maximum over-current protection for this type circuit is 20 amp., and that the inspector was in error in requiring the 15 amp. breaker changed to a 20 amp. breaker?
—H.L.H.

A. There has been quite some confusion over this rule. Section 2115 para. d, requires the installation of one or more branch circuits for the receptacle outlets in the kitchen, laundry, pantry, dining room and breakfast rooms of dwellings and requires that such circuits be wired with not smaller than No. 12 wire.

This paragraph does not, in itself, call these circuits 20 amp. circuits, but a footnote refers us to Sec. 2123 -c-3. This latter paragraph (2123-c-3) then mentions "20 amp. branch circuits conforming to the provision of para. b of Sec. 2115".



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Already 2,566,902 sales messages in business and trade magazines are telling industry's men who make decisions about the greater economy of insulated wire and cable with Alcoa E.C.* Aluminum conductor.

Readers of 18 leading industrial and management magazines have learned about the significant savings possible when their engineers and suppliers *figure it in aluminum*. Architects, engineers, electrical men in every industry from food processing to mining. More and more, they're deciding to *install* aluminum.

Alcoa makes the light, strong, conductive E.C. Aluminum, which leading wire and cable manufacturers fabricate into electric wire and cable. They have it now. ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh 19, Pennsylvania.

*E.C.: Electrical Conductor Aluminum



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40 Years' experience plus modern design is built into every R&S product.

R&S reflector contours are scientifically designed with high reflection factor providing a maximum of safe controlled light at minimum cost.

Thorough inspection and rigid factory controls insure longer life and low maintenance.

R&S explosion-proof lighting fixtures are supplied with a standardized base common to all sizes. Reflector globe assemblies of various capacities are interchangeable to suit conditions. No need to disturb mounting or electrical connections. Modern design simplifies mounting and affords a variety of conduit arrangements in one standard base. Installation costs are lower, parts fewer and ordering easier.

In hazardous areas, you can't afford to experiment. R&S explosion-proof and vaportight lighting fixtures are precision built and pass the rigid tests of Underwriters' Laboratories.

Specify R&S and be sure. Write for our catalog. You will find it valuable in planning new work and bettering existing installations to meet tomorrow's standards.

**Sold through Electrical Jobbers
Sales Representatives in Principal Cities**

Please address Dept. No. 4

36



The above however, does not clear up the confusion but reference to Sec. 2122, should provide the answer. This section covers over-current protection for branch circuits and in paragraph a, states that the rating of the over-current protective device (fuse or circuit breaker), shall not be in excess of the carrying capacity of the circuit conductor.

Thus the circuit breaker or fuse, on the No. 12 wire, appliance receptacle circuit could be a 15 amp. rating but must not exceed 20 amp.—F.N.M.S.

Service Drop Conductors

Q. A factory has added a good sized one story addition to their plant and want to serve this addition by means of a second set of service drop conductors. The insurance inspector claims that their insurance rates will be increased if the same plant is served by two separate service drops and by two sets of service equipment located approximately one block apart.. Would such an installation be a Code violation?—W.S.

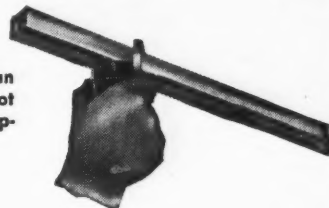
A. Section 2321 of the National Electrical Code definitely gives the electrical inspector authority to accept multiple service drops to a building when in his opinion either the area or the load requirements make such multiple services desirable. It is difficult to understand why an insurance inspector could justify a rate increase unless he could point to some possible fire hazard. Therefore I would suggest you call his attention to this section of the Code.—G.R.



Detroiters Charles E. Johnson (left), Universal Electric Products; and Don Blackburn, Don Blackburn & Co., enjoy a lobby chat during recent NISA convention in Pittsburgh.



The slot's the thing! You can get current at the exact spot where it is needed, by tap-off Plugs or Trolleys.



This electrician is plugging into Universal Trol-E-Duct right where he wants. Bulldog manufactures Vacu-Break Safety Switches • SaffToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStrubution DUCT • "Plug-In" Type BUStrubution DUCT • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

Sales keep rolling in on this track

EVERY lighting system you install will mean more sales ahead . . . if you always put in Bulldog Universal Trol-E-Duct.

It's the modern lighting method. It blankets a plant with current that can be tapped anywhere along the Universal Trol-E-Duct track. Soon as your clients figure their savings, you'll see more sales come rolling in.

They save with Bulldog Universal Trol-E-Duct every time they move a light . . . and whenever the lighting layout itself must be moved.

How your clients save

With old-style lighting systems, moving a fixture means a rewiring job with production loss while power is cut off to tap in. With Universal Trol-E-Duct, such expense is eliminated. Lights can be moved and tapped in anywhere . . . no rewiring, no power shutdown.

Complete standardization and prefabrication make Universal Trol-E-Duct salvable. The entire system itself can be moved, with *no loss of parts*.

Contractors can estimate their installation costs more accurately as Universal Trol-E-Duct is completely prefabricated and standardized. This Bulldog system serves lighting fixtures of any type, and small portable tools as well.

In 11 leading trade publications that reach 316,931 prospects, the story of Bulldog Universal Trol-E-Duct is being told to your clients through an advertisement similar to this one. It's an invitation for you to follow through with sales.

Bulldog's Field Engineers welcome the chance to sit in on planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation and maintenance costs, as well as highest efficiency and reliability in actual operation. Why not take advantage of this pre-building service?

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG



HEADQUARTERS FOR ELECTRICAL DISTRIBUTION

*A Successful Project with
Dolph in the picture*



**Dolph's Synthite
AJR-7 for
Economical Insulation**

What are little coils made of? (or big ones)

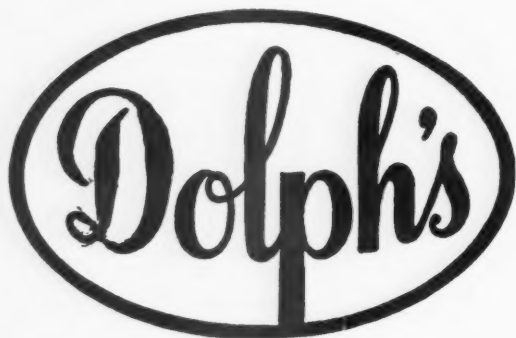
The Nothelfer Winding Laboratories, Trenton, New Jersey, needed an insulating varnish that would:

Provide high heat-resistance and high dielectric strength to their custom-designed, custom-built coils — at a moderate cost.

Dolph's Synthite AJR-7 Clear Baking Varnish does the job for them. It also affords rapid, deep-curing and excellent bonding at lower temperatures than similar type varnishes usually require.

Dolph's Synthite AJR-7 is not affected by oil, acid, or moisture. It is exceptionally stable in the dip-tank, affords a build-up of $4\frac{1}{2}$ mils per coat, and has a life of over 500 hours at 212°F. Synthite AJR-7 is an ideal all-purpose varnish for both production and repair.

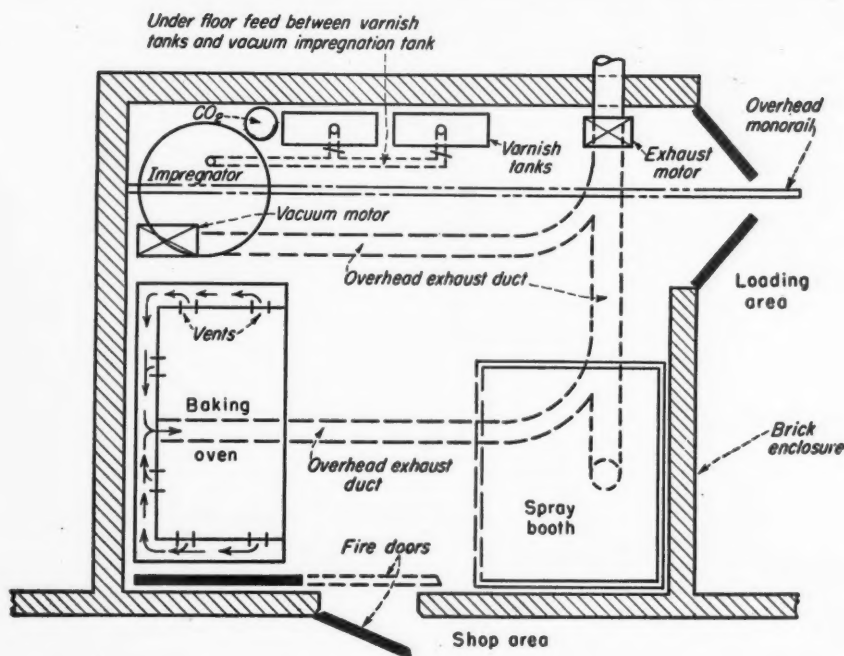
Why not call on our Technical Service? These men are thoroughly trained to help you plan your preheating, impregnating, draining, and baking cycle. They'll recommend the *correct* varnish for you. Meantime, write for our catalog. John C. Dolph Co., 1056 Broad Street, Newark, New Jersey.



Member Electrical Insulating Varnish Section, NEMA

I N S U L A T I N G V A R N I S H S P E C I A L I S T S

Motor Shops



Fireproof vault contains equipment for spraying, baking and impregnating. Overhead exhaust system serves all equipment and entire area is separated from main motor shop area by fireproof doors.

Fireproof Vault

All operations in which volatile gasses or vapors are created are confined to a single fireproof vault adjacent to the motor repair shop of the L and P Electric Company, Brooklyn, New York. These operations primarily consist of baking, spraying and varnish impregnating. Equipment is located compactly, the area is sealed from the main shop, and every precaution is taken to maintain safety.

Baking facilities consist of an electrically heated and thermostatically controlled baking oven. The heavy cover is properly counterweighted for easy operation and vents around the upper walls of the oven open into a bordering exhaust duct. At the rear of the oven next to the vault, this border duct system is connected to a vertical duct that rises to the ceiling level and is connected to the main overhead exhaust duct system.

All work requiring spraying is confined to a metal spray booth which occupies one corner of the vault. The hood of the booth is also vented and connected to the overhead exhaust duct system. In addition, the booth is illuminated by vaporproof incandescent floodlights.

Impregnating coils is performed in a rugged vacuum-pressure tank. Adjacent to the tank is a cylinder of carbon dioxide and, connected to the tank by underground valved pipe lines, two varnish reservoirs containing two different types of insulating varnish. A vacuum pump is located above the tank and this, also, is connected to the overhead exhaust system. When wound assemblies are ready for insulation they are first baked to remove all traces of residual moisture. They are then placed in the vacuum-pressure tank and the tank is sealed. A vacuum of 29 inches is then created in the tank and this condition is maintained for 30 minutes. During this period, the proper valve beneath the varnish reservoirs is opened and the desired varnish is drawn into the tank for vacuum impregnation. After this initial half-hour interval, the exhaust motor is stopped, the varnish line valve closed and the carbon dioxide valve opened. Approximately 40 pounds of pressure is developed in this manner and the wound assembly is left in this pressure for another half hour. At the end of this second interval, the varnish line valve is opened, the pres-

sure in the tank forces the varnish back to the proper tank, the valves are again closed and the tank opened. Carbon dioxide is used for additional safety.

An overhead monorail and chain hoist is another feature of the fireproof vault and runs from a point above the impregnating tank to an outdoor loading area. The entire vault is of brick and two fireproof doors separate this area from the main shop. The fireproof door normally in use is a manually opened and closed door. The second door is normally open and is closed through the action of a fusible link which melts at a predetermined temperature.

Drum-Bottom Dipping Tank

The Bay City Electric Works, San Diego, Calif., operated by Robert Norris and his son Charles Norris, built its own dipping tank out of galvanized iron. There is nothing unusual about that, except that one feature of the design is not ordinarily seen in such tanks. The bottom has been rounded lengthwise of the tank on a 20 inch radius.

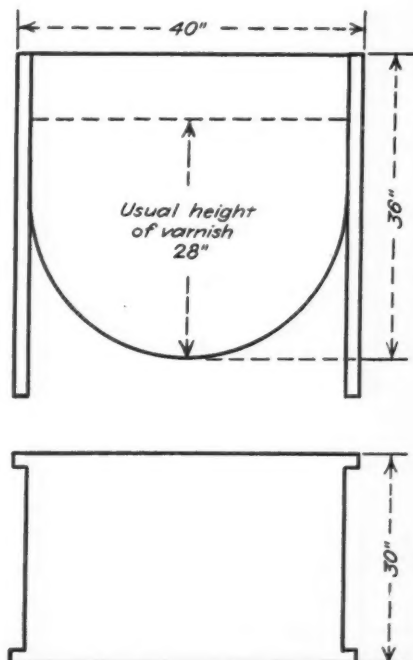


Diagram of dipping tank used at Bay City Electric Works.

TOUGH JOINTS!

Engineers of a large electrical power utility expect joints of new underground cable to last 30 to 40 Years.



Two half laps of No. 33 "SCOTCH" Electrical Tape with Vinyl Plastic backing protect the crimp splice. The splice is then built up to full cable diameter with No. 23 "SCOTCH" Electrical Tape with Polyethylene backing, after which it is given a final impervious, abrasion resistant jacket of No. 33 "SCOTCH" Electrical Tape with Vinyl Plastic backing. In a series of tests, one such splice stood 70,000 volts for 45 seconds.

For dependable dielectric strength, abrasion resistance and a tight seal

against water, oil and acids you can always count on No. 33 "SCOTCH" Electrical Tape with Vinyl Plastic backing. The superior stretchability of "SCOTCH" Electrical Tape allows it to be pulled down tight and to conform to irregular surfaces.

If you would like to know how others are making better cable splices—faster—and saving money—call or write us today, a "SCOTCH" Tape engineer will call and give you the entire story.

No. 33
SCOTCH Electrical TAPE
BRAND

ANOTHER 3M COMPANY PRODUCT



Made in U. S. A. by MINNESOTA MINING & MFG. CO. St. Paul 6, Minn.

This was not done in order to save on quantity of varnish for the initial charge, though it accomplishes that. The real reason was to do away with as much of the corner waste space as possible, into which the work never gets. It is in these corners and dead spaces that the varnish collects and does not circulate freely and where it starts to thicken and get gummy.

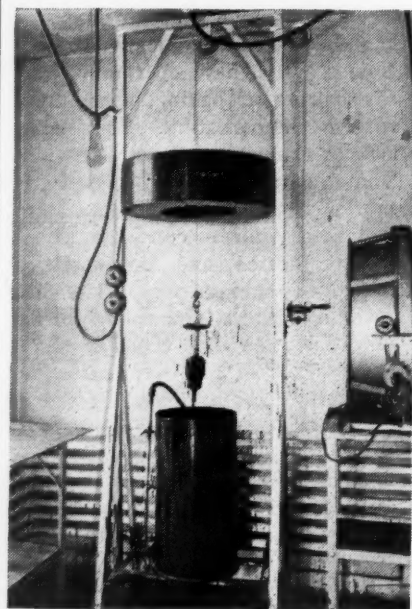
A tank of the dimensions shown by the diagram will take up to a 150 hp. stator, depending on the rpm.

Dip-Bake Unit for Small Motor Work

Horizontal infrared bake ovens of the cylindrical type have been in use for some time in the small motor department of the Willey-Wray Electric Company, Cincinnati, Ohio. They worked well, but there always was the problem of varnish dripping off the dipped coils and depositing on the bottom of the oven.

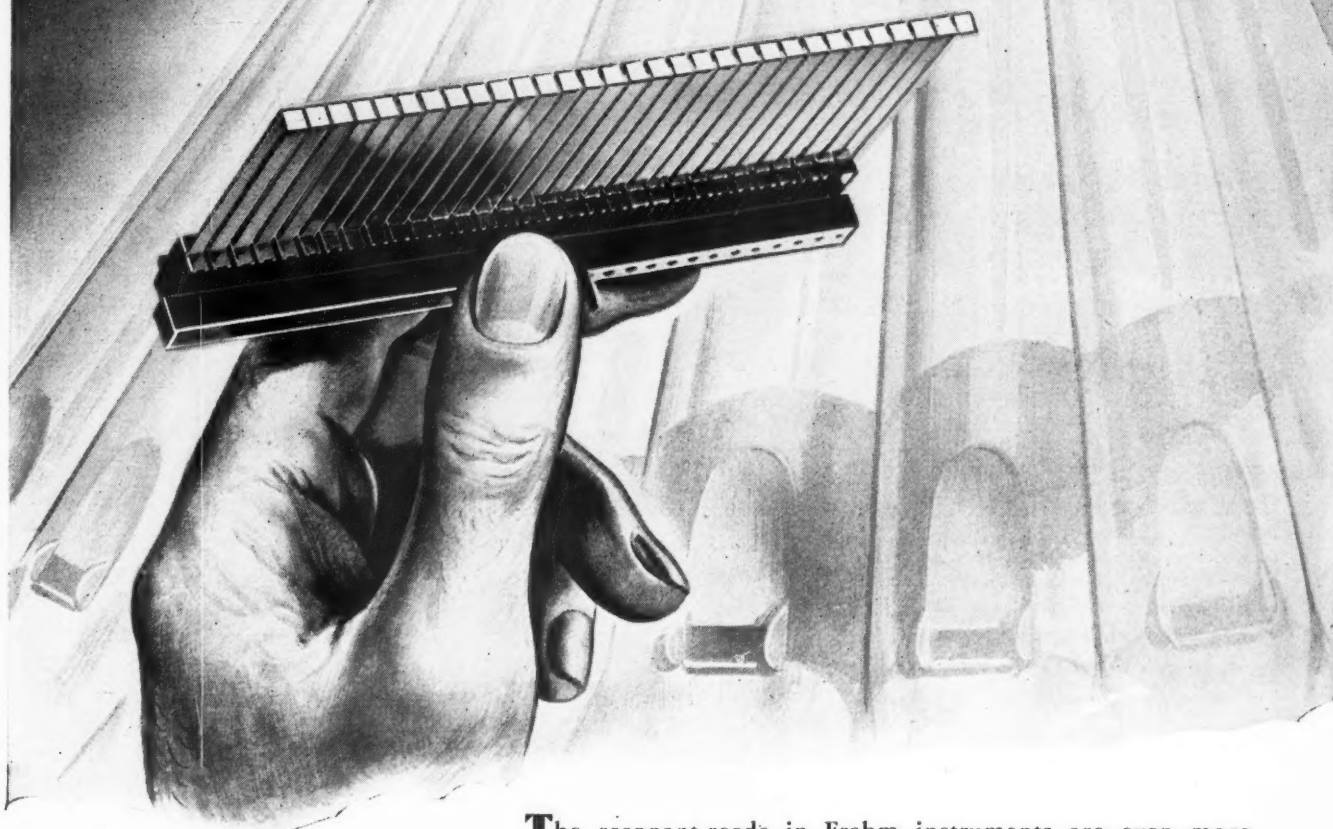
Frank Willey cleverly eliminated this by mounting an infrared cylinder vertically above the dip tank. Now the varnish can drip back into the tank while the coils are being baked and the oven interior is always clean. Called a "dip-bake assembly", this new device works so well that larger units are now planned for shop use.

A tall 1½-inch channel-iron frame (9-ft. tall for the 9-lamp unit) supports the assembly. The dip tank rests on a platform grate several inches above floor level to provide clearance for sweeping. A hand reel with a ratchet stop and steel cable, operating on ball



Dip-bake assembly designed for use in small motor department of the Willey-Wray Electric Company. Unit contains vertical infrared oven and two-section, forced-flow varnish dip tank.

Tuned... like a Pipe Organ

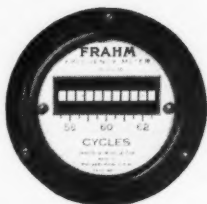
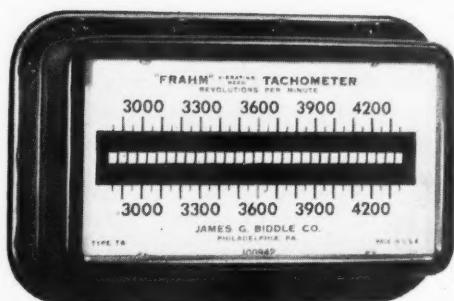


The resonant-reeds in Frahm instruments are even more simple, accurate, trouble-free and long-lived than the pipes in an organ. There is literally nothing to wear or get out of adjustment. They are permanently tuned for the life of the instrument and each reed responds to its own vibrational frequency, swinging unflinching into resonant action.

There are three important applications of the Frahm Resonant-Reed principle:

1. *Tachometers*, that are mounted directly on turbines and other equipment—and require no belts, gears or electrical connections . . . also portable types for hand use. For speeds between 900 and 100,000 rpm or vpm. *Bulletin 31-EC.*
2. *Frequency Meters*, wherein the reeds are actuated directly by a small electro-magnet, and give instant indications of frequency between 15 and 500 cps. *Bulletin 32-EC.*
3. *Frequency-Sensitive Relays*, which operate on a given frequency impulse or upon slight deviation from a specified frequency. Particularly appropriate where a frequency impulse can be super-imposed, for example, on a d-c circuit—also used as a frequency monitor.

Correspondence on these and other applications of Frahm Resonant Reeds will be welcomed.



Shown above is the Frahm Tachometer for permanent mounting. To the left is the miniature type Frahm Frequency Meter for permanent mounting.

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Electrical & Scientific Instruments

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ONCE you use Solar SCRUITs, you'll have no use for old-fashioned tape-and-solder wire connections. SCRUITs are sturdy plastic caps with a spring wire insert. They are as easy to use as putting a nut on a bolt.

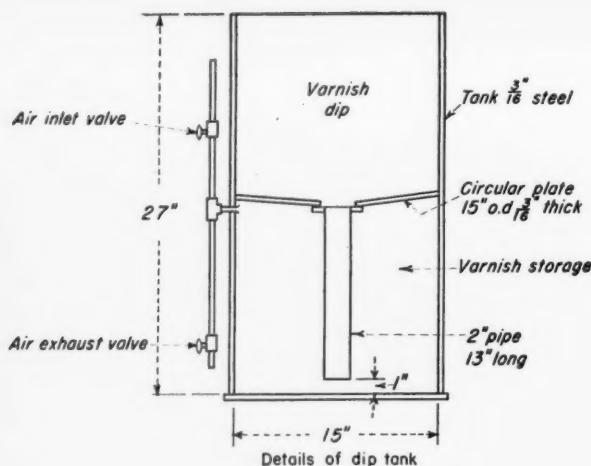
1.
STRIP THE WIRES
 2.
SCREW ON A
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THAT'S ALL—
a tight, permanent
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- SCRUITs are approved by Underwriter's Laboratories, Inc. and are endorsed by leading electrical contractors and electricians. They are safe, sure, efficient and economical.
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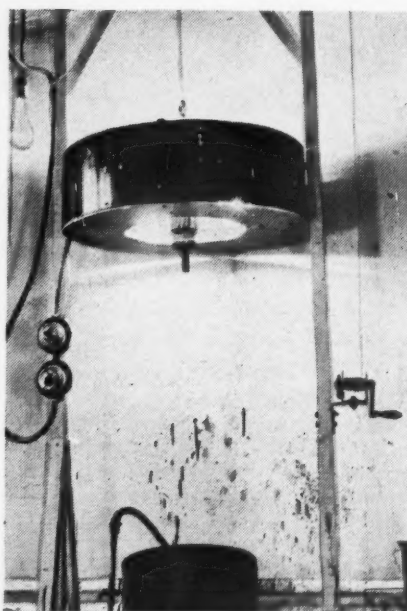
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SOLAR ELECTRIC CORPORATION
FACTORY and SALES OFFICES
WARREN, PENNSYLVANIA



LAMP RING			WORK max. dia.	TANK DIMENSIONS			PIPE RACK SIZE	
No. of lamps	Inside lamp dia.	Inside band dia.		Overall depth	Dia. of tank	Depth of storage tank	Height	Pipe size
9	14.5"	28.5"	10"	27"	15"	14"	9'-0"	1 1/4"
11	17.5"	31.5"	13"	30"	18"	17"	10'-0"	1 1/4"
12	18.5"	32.5"	14"	36"	19"	17"	9'-0"	1 1/2"
13	20.5"	34.5"	16"	39"	21"	20"	11'-0"	1 1/2"
15	23.5"	37.5"	19"	45"	24"	23"	12'-0"	2"
16	23.5"	37.5"	19"	45"	24"	23"	10'-0"	1 1/2"

Details of dip tank construction and tentative dimensions for larger dip-bake



After armature has been dipped, it is hoisted into the infrared ring mounted above the dip tank. Excess varnish drips back into tank. Two switches give dual heat control to this nine-lamp unit.

bearing pulleys at the top of the frame, is used to lift the work out of the tank and into the infrared ring.

The ring itself is mounted to the frame directly above the dip tank and about two-thirds of the way up. Except for the opening to receive the work, the lamps are fully enclosed in a steel cylinder. Inside band diameter is 28.5 inches for the 9-lamp oven; 37.5 inches for the 16-lamp oven (tentative). Inside lamp diameter (work opening) is

14.5 inches and 23.5 inches respectively. Ring diameters for other lamp capacities are in proportion as indicated by the attendant table. These larger units are now in the planning stage and actual dimensions may vary when units are built.

Dip tank design features two sections: The top portion for actual dip and the lower for varnish storage. A 3/16-inch thick circular plate, slanting downward toward a center opening, forms the division. Welded to the bottom of this opening is a 13-inch length of 2-inch pipe. This comes to within one inch of the tank bottom and channels the varnish into the upper section.

Forced-flow impregnation is used. Compressed air piped into the top of the storage section forces the varnish up through the center pipe into the dip section where the work has been placed. When the varnish completely submerges the work, the air inlet valve is closed. After the prescribed time for proper impregnation has elapsed, the air exhaust valve is opened and the varnish drains back into the bottom of the tank.

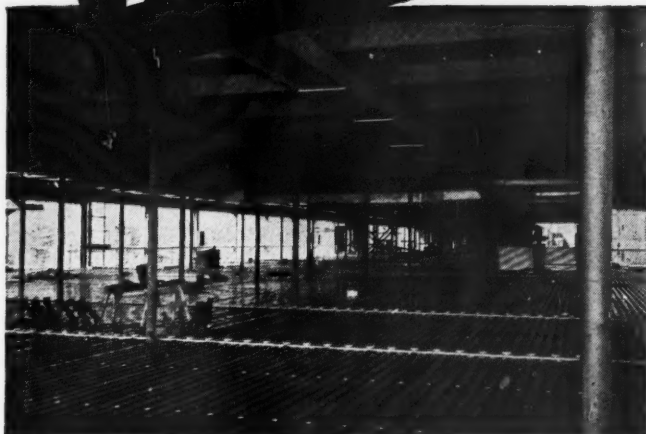
After the dip section is drained, the stator or armature is attached to the hoist cable and pulled up into the infrared ring. Whatever excess varnish remains on the work drips off into a very shallow cone cover (with drain hole) placed over the tank.

The oven unit illustrated contains nine infrared lamps. Two manual switches (one controlling five lamps; the other, four) provide dual heat. Time clock control can be added.



New building addition to Country Life Press, Garden City, N. Y., containing 110,000 sq ft of floor space with electrical raceways always quickly and conveniently available.

**PLANNED
FOR A LIFETIME**



Q-Floor in place on first floor. Notice large number of cells—everyone available for wiring.

CONSTRUCTION DATA

Architect:H. T. Lindeberg
General Contractor:..George A. Fuller Company
Consulting Engineer:Clyde R. Place
Electrical Contractor:..Naumer Electric Company



Country Life Press, Garden City, New York, needed a wiring system that would permit fast relocation of electric equipment—a wiring system that would be readily adaptable to changes in circuits and outlets with a minimum of expense. When they planned this new 110,000 sq-ft plant addition, they could determine initially needed electrical and signal outlets. However, it was practically impossible to estimate future demands. To meet these, Country Life included Robertson Q-Floors with General Electric Q-Floor Wiring, to give them the electrical flexibility they needed.

Buildings equipped with General Electric Q-Floor Wiring enjoy a decided advantage. At any time during the life of the building, circuits can be removed or new outlets can be installed on the floor surface where they are needed, when they are needed, in a few minutes. Changes can be made easily and quickly, without digging trenches, and without interrupting occupants' activities.

By means of simple fittings, the entire Q-Floor becomes part of the electrical and signal distribution system. Since the cells are on 6-inch centers, outlets can be installed every six inches. To add a new outlet, it is necessary only to tap through the floor into the Q-Floor cell and install the floor outlet.

Want more information on General Electric Q-Floor Wiring? Write on your letterhead for a free copy of the *Q-Floor Wiring Data Manual*—address Section C7-918, General Electric Company, Bridgeport 2, Connecticut.

Q-Floor is manufactured only by the H. H. Robertson Company, Pittsburgh, Pa. Samples can be seen at any General Electric Construction Materials office or Robertson District Office.

GENERAL  ELECTRIC

America's Finest Aluminum Cables

as much as 50% lighter

and more economical!



U. S. Aluminum Cables—up to 50% lighter than ordinary cables—are extremely easy to install . . . easy on the pocketbook. Available with either Neoprene or braid cover—both are tough and abrasion-resistant.

Write for the new 32-page booklet describing all types and sizes of "U. S." aluminum wires and cables. Address Wire and Cable Department, United States Rubber Company, 1230 Avenue of the Americas, New York 20, N. Y.



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U.S. RUBBER
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UNITED STATES
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In the News

NECA Apprenticeship Award

The outstanding apprentice in the electrical industry will be presented with the National NECA Apprenticeship Award at the 47th Annual Meeting in Miami Beach, Fla., the National Electrical Contractors Association has announced.

The Award will include an all-expense trip to the Annual Meeting, including payment of wages for time lost while attending the meeting, a \$100 purse and medal, and a citation commemorating the winner's selection as the industry's outstanding apprentice.

The outstanding apprentice in each NECA Vice Presidential District will also receive a medal and a commendation from the NECA Apprenticeship and Training Committee.

Presentation of the National NECA Apprenticeship Award at the Annual Meeting each year was announced at the 46th Annual Meeting in San Francisco. The NECA Apprenticeship and Training Committee at the direction of the Labor Relations Committee drafted a plan for the selection of the recipient of the 1948 Award. The plan for selection has been worked out so as to provide for the fullest geographical representation as well as the careful qualification of all contestants.

The outstanding apprentice in each NECA Vice Presidential District will be selected through a district-wide contest, and the nation's outstanding apprentice will be chosen from among the district winners. Any Chapter or established local joint apprenticeship and training committee may submit the names and qualifications of its local contestants to the NECA Vice President of the district in which it is located. Each submission must be accompanied by a brief outlining the record and qualifications of contestants. After the closing date for local entries in the contest, the NECA Vice President shall appoint a District Award Committee composed of contractors from the Districts who shall select the District's outstanding apprentice and forward his name and qualifications to the National Award Committee which will make the final selection.

Details concerning the contest and rules of eligibility for entrants will be announced soon.

National Joint Board Agreement

More than 2,000 contractors have signed stipulations agreeing to be bound by the provisions of the National Joint Board for settlement of jurisdictional disputes in the construction industry.

Of 44 requests for decisions, 28 have come from contractors or contractor associations and 16 from unions affiliated with the A. F. of L. Building and Construction Trades Department.

Four cases have been closed, one by agreement of the laborers that the laying of wood fibre conduit underground for the carrying of electrical wire and cables was work under the jurisdiction of the electricians.

Six Joint Boards have been established to decide disputes on new issues which the Board of Trustees found were not covered by an existing decision or agreement of record. Hearings have been held in three of them, and are pending in the other three.

Twenty disputes, involving 17 different issues, may also go to hearings because they are not covered by precedent and Richard J. Gray, President of the A.F. of L. Building Trades Department, has been unable to work out a voluntary settlement between the presidents of the unions involved.

That is the progress already made under the machinery put into effect on May first by agreement of contractor associations and the 19 A. F. of L. Building Trades Unions. The purpose is to settle jurisdictional disputes between unions within the industry itself without work stoppages. The contractors, who often are party to the dispute because of work assignment, have an indirect voice in the decision through a contractor representative sitting on the joint board. The alternative to peaceful settlement of these disputes is intervention under the Taft-Hartley law by the National Labor Relations Board.

Establishment of a joint board, consisting of two industry and two labor representatives and chairman John T. Dunlop, means that a dispute is not covered by a decision or agreement recognized by the AFL Building and Construction Trades Department; and that Gray has been unable to get a voluntary settlement between the international presidents of the unions involved.

A joint board's decision then becomes a decision or record applicable nationally to all building trades unions. It is added to some 50 decisions and agreements published in a "Green Book" as those recognized by the AFL.

Local settlements of jurisdictional disputes is encouraged by the current plan in those areas where procedures for settling them are available. However, these local settlements or agreements will apply only to the particular job in question, and an appeal may be taken directly to the National Joint Board by any of the parties.

Requests for decisions filed with the National Board by unions, contractor associations or individual contractors are first screened by the board of trustees. The first step is to ask the unions involved if they consider any existing decision or agreement as being applicable to their dispute. This is to assist the trustees in deciding whether the issue has already been settled.

If the trustees find that a dispute is covered by a recognized decision or agreement, a decision is made and the case closed. This has happened in two cases.

If the issue is a novel one not covered by precedent, the matter is referred to Gray, as head of the building trades, to try to get the unions to reach an agreement. Any agreement reached becomes a precedent of "Record" applicable in future disputes on the same issue.

If no agreement is reached in 10 business days, a joint board is then established to hear evidence at a public hearing and render a decision. Thirty-day advance notice of the hearing is given to all unions affiliated with the building trades and participating employer organizations so that any of them may intervene to protect their interests if they wish.

The agreement establishing the settlement machinery is binding on all unions affiliated with the AFL Building and Construction Trades Department. In behalf of the industry, it was signed by A.G.C. and seven specialty contractor associations, but it is not binding on any contractor unless he individually, or his association in his behalf, signs a stipulation to that effect. The A. G. C. does not bind any of its member contractors.

Any contractor employing members of the AFL Building Trades, whether or not a member of a participating

Immediate Delivery
FROM STOCK



"PM" TYPE CONTROL TRANSFORMERS

USED on magnetic starters, breakers, cabinets, etc., for outside mounting where lower than line voltage is desired. Equipped with nipple and locknut for knockout mounting. Made in 50-60 cy. — 460/230 volts primary, 115 volts secondary. Capacities up to 250 V. A. inclusive.

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*The Dongan Line
Since Nineteen-Nine*

DONGAN
TRANSFORMERS

Write for
NEW
CATALOG

association, may avail himself of the procedure by signing a stipulation to abide by the agreement.

Mr. Dunlop, labor relations expert and associate professor at Harvard, is permanent chairman of the Board of Trustees and sits as impartial chairman of all joint boards.

Industry trustees are James D. Marshall, Assistant Managing Director of A. G. C.; Edward P. Palmer, President of Senior & Palmer, Inc.; Paul M. Geary, Executive Vice President, National Electrical Contractors Association; and H. R. Cole, executive secretary, Tile Contractors Association.

Labor trustees are Gray; M. A. Hutcheson, First Vice President, Carpenters Union; William C. O'Neill, General Organizer, Plumbers Union, and James W. Close, General Secretary-Treasurer, Sheet Metal Workers Union.

Joint boards—more like panels than boards—are appointed separately for each dispute, with Mr. Dunlop the rotating chairman of all of them. The two industry and two labor representatives for each board are selected from two standing pools of 12 from each side. None selected may have an interest in the particular dispute on which he sits. Of the two industry representatives on a board, one must be from the general contractors group and one from the specialty contractors.

The labor pool consists of 12 international presidents of AFL Building Trades Unions, including the eight vice presidents of the Building Trades Department.

Among the members of the industry pool is A. Herrmann Wilson, President of Electrical Construction Co., Washington, representing the National Electrical Contractors Association.

Construction Volume

Investment commitments for construction in the thirty-seven states east of the Rocky Mountains soared to \$4,766,795,000 in the first half of this year to set an all-time dollar record for a first-half period.

This was revealed by F. W. Dodge Corporation, a fact-finding organization for the construction industry, of tabulations of reports on projects for which contracts were awarded in the first six months of this year.

The previous record for a first-half period was \$3,937,736,000 established in 1946.

Contract volume in the first six months of this year was 36 percent higher than that reported for the cor-

MORE QUICK CLEAN
Pipe Cuts
FOR YOUR MONEY

RIGID Cutter with thin blade wheel rolls easily through all kinds of pipe

● It's a cinch to cut pipe or conduit extra fast with the new efficiency-balanced **RIGID** cutter. Extra cutting power comes from the heat-treated tool-steel blade; tough and thin, it rolls easily through any kind of pipe—leaves practically no burr—tracks perfectly. Every cutter factory tested. Your choice of five sizes to 6" pipe; four-wheel cutters to 4". Choose the favorite of electrical men all over the world—buy **RIGID** cutters at your Supply House.

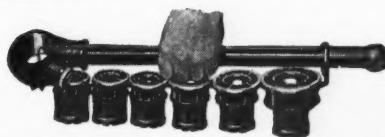
Nos. 42 and 44, 4-wheel cutters for fast quarter-turn cutting.



EXTRA EASY
Threading
OF SMALL PIPE

RIGID 00R Ratchet Threaders give quick, clean threads on 1/8" to 2" pipe

● No bothersome get-ready with these handy little **RIGID** Threaders. Just snap in size die head you need and go to work. Even on close-to-wall threads there's no fuss or trouble—no extra dies required. These **RIGID** Threaders make it easy to get clean, quick threads on all kinds of small pipe and conduit. Sturdy steel and malleable construction—long life heat-treated tool-steel dies. No. 00R 1/8" to 1" pipe; No. 111R, 1/8" to 1 1/4"; No. 12R 1/8" to 2". Buy them at your Supply House.



Free handy carrier for any group of sizes.

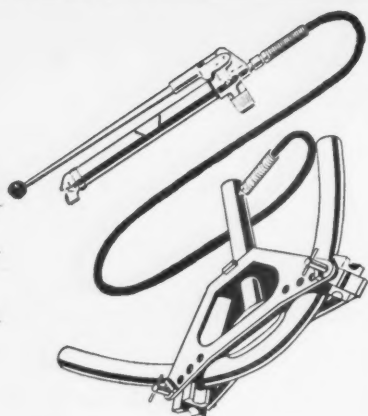


RIGID

**WORK-SAVER
PIPE TOOLS**

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

A BLACKHAWK PIPE BENDER EARNS 3 WAYS



Your equipment can't produce profit when it's not at work. It's just smart business to choose tools that do a maximum amount of work. A Blackhawk Porto-Power Pipe Bender does MORE than bend pipe. It also uses the spare hours between pipe-bending jobs to do dozens of other profitable shop operations. Buy the pipe bender that does give you "extra" utility—Buy a Blackhawk from your Blackhawk Industrial Supply Distributor.

1



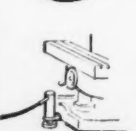
PIPE BENDING—Bends rigid conduit and pipe of all popular diameters. Saves need for elbows, couplings and extra cutting and threading.

2



MAINTENANCE AND PRODUCTION—Special attachments are available for the power unit which push, pull, bend, press, spread, and clamp—pull gears, lift machinery and lick scores of other jobs.

3



SPECIAL JACK—Compact Hydraulic Ram works in all directions—at any angle. A versatile, safe, remotely-controlled jack.

FOR INCREASED PROFITS...YOU CAN NOW CONVERT YOUR HAND-OPERATED PIPE BENDER TO POWER OPERATION

ONE MAN OPERATION

With the amazing new P-182 Electrically-driven hydraulic pump one man can easily bend any size of pipe. Single control knob leaves hands free for measuring, etc. Get full details on the new P-182 from your Blackhawk Industrial Supply Distributor.



New P-182 Electrically-Driven Hydraulic Pump

Here is a real "profit-package" for you. This simple fast conversion brings you speed, power and greater economy. The P-182 triples ram speeds—slashes pipe bending time—eliminates fatigue. It is a complete package containing pump, reservoir, valves and controls.



A Product of BLACKHAWK MFG. COMPANY, Dept. P2098, Milwaukee 1, Wisconsin

BLACKHAWK



V. E. DeLay, small motor department superintendent of the Industrial Engineering Equipment Co., Davenport, Iowa, discusses shop problems with H. A. Dayton, Chicago district service manager of the United Motors Service.

responding period of 1947. The greatest gains were in nonresidential building, which showed a rise of 60 percent. Residential awards were 24 percent higher than in the first half of last year while heavy engineering works showed a gain of 26 percent.

As compared with the first half of last year, the gains in the Dodge corporation's 15 reporting regions were 25 percent or more, except in New England, where the gain was 13 percent, Texas, with a decline of 4 percent was reported.

Areas in which volume gains exceeded the average for the 37 eastern states combined were: upstate New York, up 79 percent; Southeastern states, up 44 percent; northern Illinois, Indiana, Iowa, Wisconsin and Northern Michigan, up 58 percent; Louisiana and Mississippi, up 48 percent; Minnesota, North Dakota and South Dakota, up 40 percent; western Missouri, Kansas, Nebraska and Oklahoma, up 79 percent.

Investment contracts for residential building in the first half of the year totaled \$1,823,579,000 in the thirty-seven eastern states while nonresidential contracts amounted to \$1,859,653,000. The six-months total for heavy engineering awards was \$1,083,573,000.

Northeast Texas Chapter Officers

Roy Gay was elected president of the Northeast Texas Chapter of the National Electrical Contractors Association at its annual meeting.

GEOON ON WIRE

RESISTS . . . ozone, wear, sunlight, water, chemicals and most other normally destructive factors.

GIVES YOU . . . 14 colors including NEMA standards.

PROVIDES . . . more conductors for a given space.

HAS . . . excellent electrical properties.

IS . . . easy to draw, easy to strip. And is light in weight.

Wire and cable insulation made from Geon polyvinyl resins is suitable for industrial, manufacturing and utilities wiring. Where the best wire and cable insulation is required, specify Geon by name. For information regarding special applications, write B. F. Goodrich Chemical Company, Department H-9, Rose Building, Cleveland 15, Ohio. In Canada, Kitchener, Ont.



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ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . SEPTEMBER, 1948

189

"AGED-IN-THE-OVEN"



...another
PANTHER and DRAGON
TEST
to assure you of
tapes that last

● One of the many tests PANTHER and DRAGON Friction Tapes undergo is "accelerated aging." In the oven illustrated, test samples are baked to give the effect of many months aging under natural conditions.

These "aged" tapes always compare favorably with their original high standards of adhesive qualities. That's why PANTHER and DRAGON Tapes make good splices that last... that's why more and more tape users ask for PANTHER and DRAGON.

Sold only through recognized independent wholesalers. The Okonite Company, Passaic, New Jersey.

6628

He succeeds Jim L. McClure who was named to the national board of governors. Other new officers are W. W. Knotts, vice-president; E. D. Raney, treasurer; and T. C. Sands, a director. Holdover directors are George Harris and Ernest Butcher.

Book Reviews

Lighting Design

Two main objectives; the presentation of lighting principles in a quantitative manner which will augment normal descriptive text, and the outlining of a comprehensive design method for devising high-quality lighting systems; are achieved in a new book written for both students and practicing engineers, titled, "Lighting Design." Jointly compiled and written by Parry Moon, Massachusetts Institute of Technology; and Dr. Domina E. Spencer, Brown University, the book employs the mks (meter-kilogram-second) system throughout, and clearly demonstrates that illumination can be treated as a true branch of applied engineering. Lighting practices of yesterday and today are included insofar as they furnish a starting point for trends and future possibilities in the lighting field.

That good lighting is a scientific problem which can be satisfactorily solved through proper analysis and design is expounded in detailed and logically-arranged chapters. Fundamentals, lamps and luminaires, maintenance, vision, factors to be considered in lighting design, and color are a few of the chapter headings, while the appendix fully discusses symbols used in the text, conversion factors and fundamental equations. The text is both forceful and interestingly written; lucid examples clearly illustrate the problems discussed; charts, diagrams, tables and formulas are included for reference, and both photographs and sketches, in black and in color, are included to dramatically illustrate techniques and approaches to lighting problems.

For rapid reference, all subjects are cross-indexed, and pages are designated by the decimal system as well as by progressive numbering. It should be clearly understood that this is not an elementary discussion of methods or materials used for fundamental lighting design. It is a learned, advanced text book for those who seek to apply proven theory to every-day practice. 500 pages, 6 by 9 inches, fabric cover, \$5.00, Addison-Wesley Press Inc., Kendall Square, Cambridge 42, Mass.

AUSTIN FOR LIGHTING NEEDS

The Austin Line provides material for installation of all types of lighting equipment, from high line to the last outlet. Also included

are Yard Lights, Remotrol Remote Control Switch, Weather Tight Outdoor Lighting Fixtures, and a complete line of fixture fittings.

WEATHERPROOF Yard Lights

New Austin WPL-114 fixture made of rustless aluminum, with 1/2" conduit threaded hub in back and bottom. 14" reflector.



No. SPB-12 fixture for exterior wiring, straight bracket with pole or wall mounting bracket. 12" reflector.*



No. SWB-12 fixture for connection to inside wiring system. Straight bracket with adjustable mounting flange. 12" reflector.*

*SPB-14 and SWB-14 have 14" reflectors.

REMOTROL

WEATHER TIGHT Outdoor Lighting Fixtures



No. REA-1 Pendant type, complete with globe — no guard.



No. REA-2 for 4" square, or 3 1/4" and 4" octagon outlet boxes, with globe — no guard.

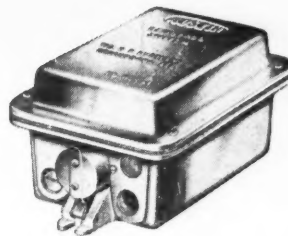


No. REA-3, 100-watt guard for use with Nos. REA-1 and REA-2 fixtures.



No. GC-100, 100-watt globe for use with Nos. REA-1 and REA-2 fixtures.

REMOTE CONTROL SWITCH



Controls yard lights from as many different switch stations as required.

FIXTURE FITTINGS

Write for complete information and prices

Studs, Extension Pieces, Nuts and Straps



WE SELL EXCLUSIVELY
THROUGH WHOLESALERS

The M. B. Austin Company
NORTHBROOK, ILLINOIS



only...
**FRANKEL
FLEXILUGS**

Underwriter Approved

offer you these
five
EXTRA ADVANTAGES

- ★ 100% conductivity in all current carrying parts.
- ★ 100% commercial thread on nut and set screw . . . a non-stripping combination.
- ★ 100% wire protection with rigid pressure distributing shoe; screw never touches wire.
- ★ Seamless drawn tube housing gives 150% strain safety factor.
- ★ Cadmium plating eliminates heating caused by formation of high-resistant copper oxide, and permits use with aluminum and steel cables.

Flexilugs are precision-built to make up tight and stay tight . . . get tough jobs done faster, easier. Three sizes take all wire sizes from 4/0 stranded to #14 solid, and give equally dependable service on stranded, flexible or solid wire.

A quality lug . . . at a practical price.

engineered

Materials selected for each part in FRANKEL Flexilugs are determined by exact service requirements of that part.

All parts are interlocked into one integrated unit . . . they cannot work loose or drop out.

Keep Frankel Flexilugs handy
. . . you'll use them every day!



Send for September 1, 1948, revised price list.

SOLD THROUGH LEADING WHOLESALERS ONLY

**Frankel
Solderless
Connectors**

FRANKEL CONNECTOR CO.

27 VESTRY ST. • NEW YORK 13, N. Y.

42 YEARS OF KNOW-HOW IN SOLDERLESS CONNECTORS



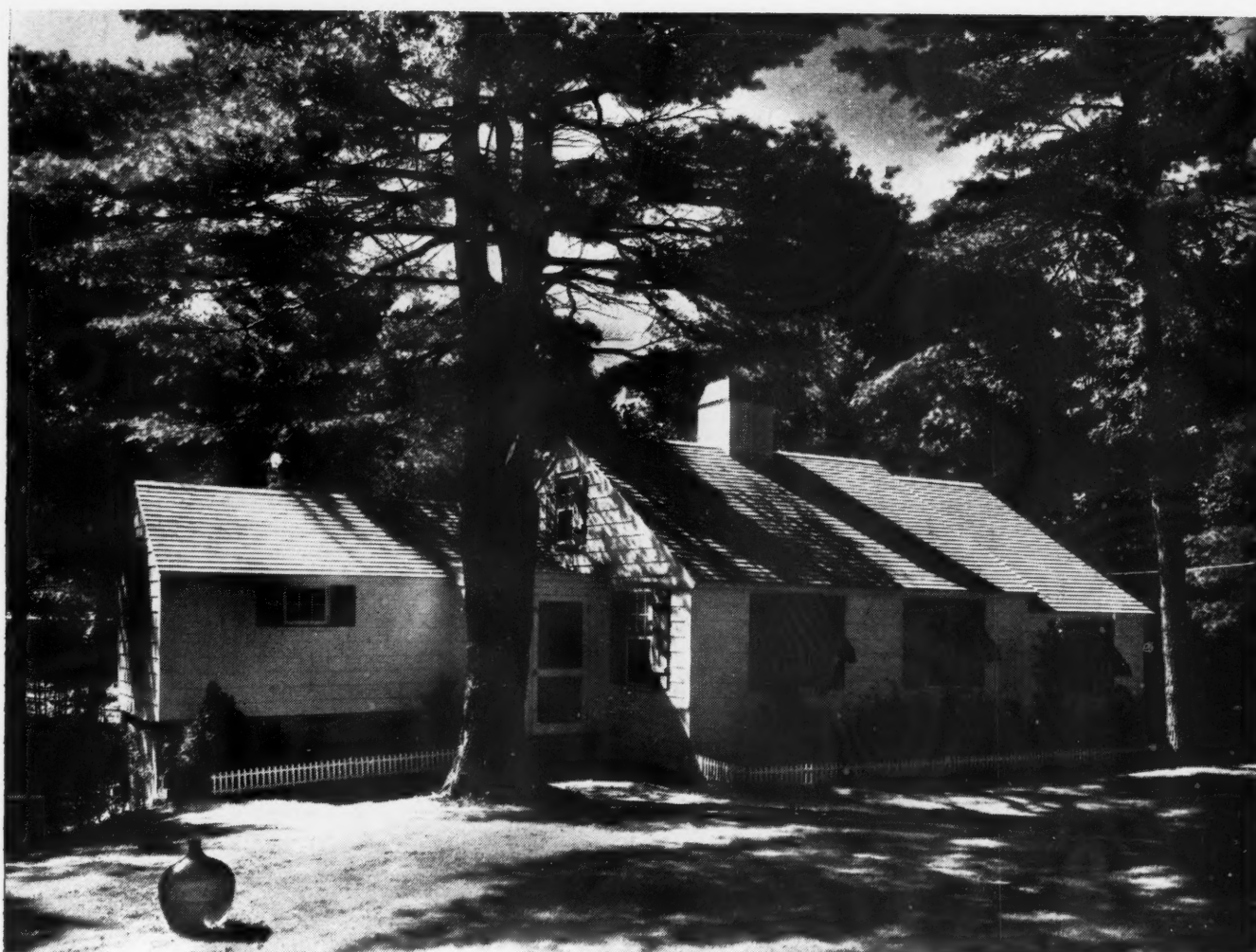
A. J. Shimer, (right) electrical engineer-salesman for the H. N. Crowder Jr. Company of Allentown, Pennsylvania, points out the advantages of electronic control to Harry Romig (center), plant superintendent of the Bradley Pulverizer Company. Robert Brokloff, a student in the local high school, observes this promotional and educational demonstration as part of a Crowder-sponsored training program.

Industrial Electronics

Design, selection, application and maintenance of electronic equipment, discussed by research engineers and scientists of the Westinghouse Electric Corporation, is presented for the first time under a single cover. Not only the scope but also the limitations of electronic equipment as used in industry are outlined in the 36 chapters and 680 pages. Each phase of the field is analysed and discussed by an expert in that particular branch so that 37 authors are represented rather than one or two writers. In addition to presenting basic theories and data connected with design, the book discusses electronic instruments, motor control, dielectric heating of woods and plastics, resistance welding, X-ray and photoelectric devices applicable to industry. Subjects are segregated into chapters according to basic laws, construction features of tubes, circuit components, application or maintenance, yet cross-references and indexing aids the user in rapidly locating all related information on any given feature. Titled "The Industrial Electronics Reference Book", the work measures 9 by 11 inches, is priced at \$7.50, and can be purchased from John Wiley and Sons, 440 Fourth Avenue, N. Y. C.

Electric Heat for Homes

A practical guide to the design and installation of electric heating for residences should be of definite assistance to contractors, architects, builders and engineers. "Electric Heating for



George R. Paul, Architect

TELEPHONE RACEWAYS MAKE A BIG DIFFERENCE—IN SMALL HOMES, TOO

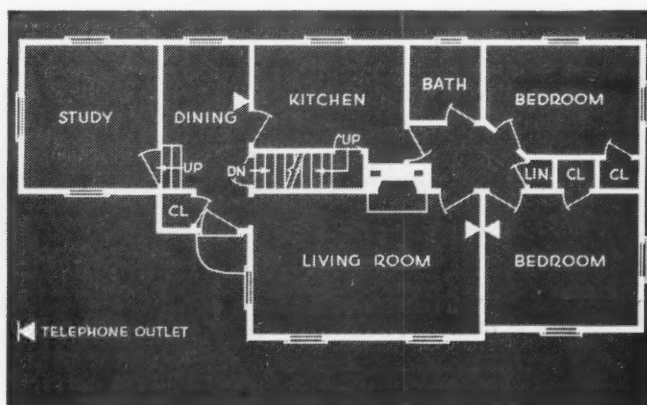
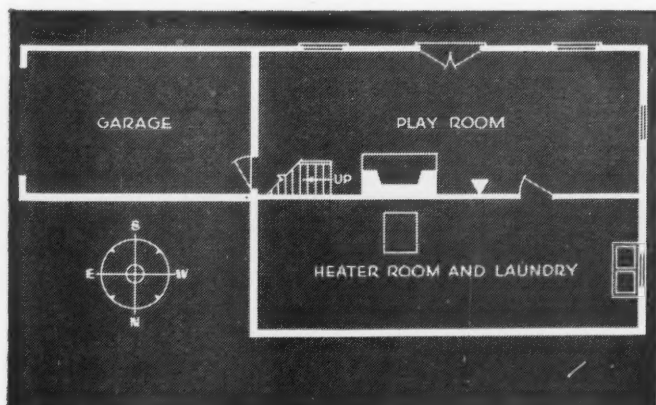
Providing telephone raceways is the sure way of avoiding exposed telephone wiring on walls and woodwork . . . providing the owner with the utmost in telephone convenience . . . and providing yourself with extra profits.

A few pieces of pipe or electrical tubing

installed inside the walls during construction provide a clear path for telephone wires to outlet locations.

Remember—NO ELECTRICAL CONTRACT IS REALLY COMPLETE UNLESS IT INCLUDES A RACEWAY FOR TELEPHONE WIRING FACILITIES.

BELL TELEPHONE SYSTEM





prevent them with **ADALET** **INSULATING BUSHINGS**

NEW!

**PRECISION
MOLDED!**

**LOW
PRICED!**

Designed and en-
gineered by the
Originators of the
Famous **SALI**
Insulating Bushings



Order from your
wholesaler, or write
today for sample
bushing and prices.



THE ADALET
MANUFACTURING CO.

A FORWARD STEP
by ADALET

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CLEVELAND 11, OHIO

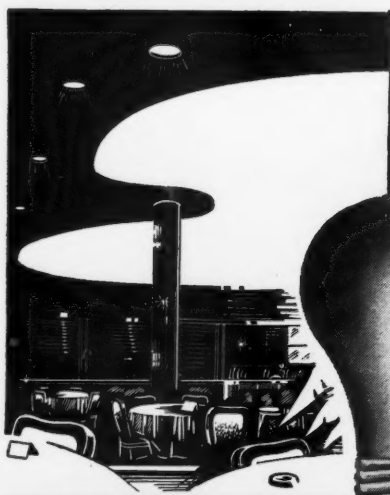


Prominent in the activities of the Elec-
trical Maintenance Engineers Associa-
tion of the Electrical League of West-
ern Pennsylvania, Pittsburgh, are: (L
to R) past president J. I. Balsley, fore-
man, electrical dept., B & O Railroad;
V. A. Keller, electrician, B & O Rail-
road; and James S. Dodds, EMEA
president and electro-mechanics in-
structor at the University of Pittsburgh.

Homes", prepared by the electric heat-
ing department and technical staff of
the Better Homes Bureau, presents the
progressive steps of design connected
with an electric heating system in
simple terms. Each step is illustrated
with a typical problem and solution.
Accompanying tables, charts and dia-
grams are included for complete dis-
cussion. Factors such as floor area,
window area, double or single pane
glass, degrees of insulation and num-
ber of exposed walls are taken into
consideration. Descriptive text dis-
cusses types of wall and floor heating
units, proper location and installation,
determination of required wire size,
and climatic information for typical
sections of the country. File size
(8½ by 11 inches), paper cover, 42
pages, price \$2.00, published by the
Westinghouse Electric Supply Com-
pany, guide number B-3768-A.

Graphs Solve Problems

Rapid and accurate solutions to a
wide variety of problems is the pur-
pose of the book, "Falk's Graphical
Solutions to 100,000 Practical Prob-
lems." Covering nearly all of the
mathematical functions used in me-
chanics, hydraulics, electricity, phys-
ics, shop work, construction, trigo-
nometry, weights and measures, the
book contains 400 worked-out graphs.
To find the solution to a problem, the
proper graph is selected, known quan-
tities are located, and the correct solu-



**DIMMING
BRIGHTENING
BLENDING**

INCANDESCENT

COLD CATHODE

EASY with POWERSTAT

LIGHTING CONTROL EQUIPMENT

There's nothing new about dimming incandescent light . . . but there's *plenty* new about the POWERSTAT method of dimming cold-cathode fluorescent! POWERSTAT Dimmers — plus the proper integration of the components of the dimming system — make cold-cathode fluorescent dimming easy, inexpensive and effective. Select the proper lamps, ballasts and transformers—add a POWERSTAT Dimmer—and your cold-cathode dimming problems are solved.

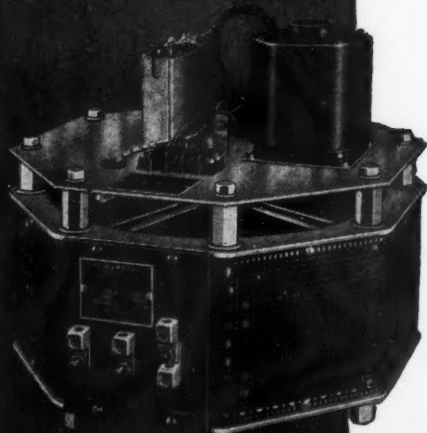
POWERSTAT Dimmers give top performance with cold-cathode or incandescent lighting treatments. They're easy to install, rugged and maintenance-free. They'll give smooth, stepless, continuously-variable control over long periods of dependable service. Because POWERSTAT Dimmers operate by transformer action, a negligible amount of heat is generated. No special ventilation problems arise with their installation. POWERSTAT Dimmers in your cold-cathode fluorescent or incandescent circuit can be placed wherever they will be most convenient for you.

POWERSTAT Dimmers — available in numerous models and a wide range of capacities—are designed for handwheel, lever action or motor driven operation. There's a POWERSTAT Dimmer for *your* application . . . write today for complete information on what POWERSTAT Dimmers can do for you.

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TYPE DJ700



TYPE DM4600T

THE SUPERIOR ELECTRIC CO.
BRISTOL, CONNECTICUT



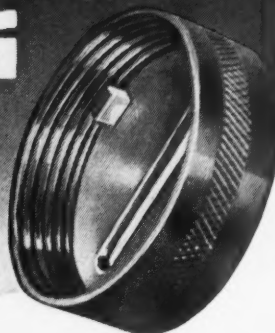
Powerstat Variable Transformers • Voltbox A C Power Supply • Stabiline Voltage Regulators.

New POSITIVE LOCK Construction of Monarch Renewable Fuses

Assures →
TRUE ALIGNMENT

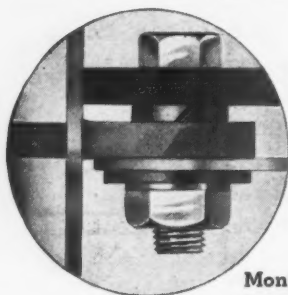
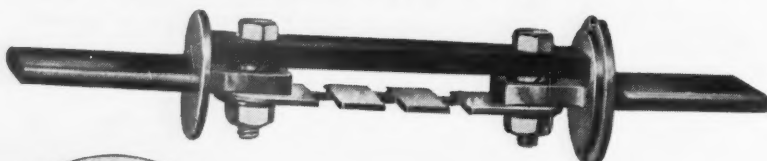


The brass lugs inside the caps used on Monarch Fuses (see illustration at right above) fit into equally spaced slots in the brass casing inserts. This new and improved Monarch construction assures true alignment of the copper holding terminals . . . and establishes a positive lock on both ends of the fuse.



and for

STILL GREATER PROTECTION . . .



MONARCH'S Compressed Tension Lock Washer construction (illustrated at left) compensates for contraction and expansion of the fibre bar by exerting constant tension on the bar . . . and assures no loose parts. The washer also separates the fibre bar from the copper terminals . . . a spacer to provide better cooling.

Monarch Fuses are fully approved and are available through recognized wholesalers.

*Specify Monarch Fuses
for improved*

FUSEvice



MONARCH FUSE CO., LTD.
118 E. FIRST ST., JAMESTOWN, N. Y.



tion is found at the intersection of these variously designated lines. Formulas and slide-rules are by-passed, for the graphs take their place and, although log-table accuracy is neither attained nor claimed, the graphs are sufficiently accurate for close approximations, making the book valuable for practical use and rough estimation. For rapid reference purposes, chapter heads are classified by subject matter, such as Chemistry, Electricity, Construction, etc. Written by Karl H. Falk, it has 400 pages, measures 6 by 9 inches, has a cloth binding, costs \$6.00, and is published by Columbia Graphs, Columbia, Connecticut.

Dates Ahead

International Association of Electrical Inspectors — Western Section, Denver, Colo., September 13-15; Northwestern Section, Salt Lake City, Utah, September 20-22; Southwestern Section, Oakland, Calif., September 27-29; Eastern Section, October 11-13; Southern Section, Heidelberg Hotel, Jackson, Miss., October 18-20.

National Television and Electrical Living Show — Coliseum, Chicago, Ill., September 18-28.

Illuminating Engineering Society — National Technical Conference, Boston, Mass., September 20-24.

Electrical Contractors Society of Washington States — Annual convention, Everett, Wash., September 25-26.

Iron and Steel Exposition and Convention — Cleveland Public Auditorium, Cleveland, Ohio, September 28-October 1.

International Association of Electrical Leagues — 13th Annual League Conference, Hotel Mayflower, Washington, D. C., September 29-October 2.

American Institute of Electrical Engineers — Fall General Meeting, Hotel Schroeder, Milwaukee, Wis., October 18-22.

International Municipal Signal Association — 53rd Annual meeting, Hotel Statler, Buffalo, N. Y., October 4-7.

New England Materials Handling Exposition — Mechanics Hall, Boston, Mass., October 5-7.

Porcelain Enamel Institute — Annual forum, University of Illinois, Urbana, Ill., October 13-15.

National Association of Housing Officials — Third annual exhibit of building and maintenance products, Olympic Hotel, Seattle, Wash., October 13-16.

National Metal Congress and Exposition — Annual convention, Philadelphia, Pa., October 25-29.

National Electronics Conference — Edgewater Beach Hotel, Chicago, Ill., November 4-6.

National Electrical Manufacturers Association — Traymore Hotel, Atlantic City, N. J., November 7-12.

Electrical & Gas Association of New York, Inc. — Luncheon meeting, Grand Ballroom, Hotel Astor, New York, N. Y., November 17.

National Farm Electrification Conference — Congress Hotel, Chicago, Ill., November 17-19.

National Electrical Contractors Association — 47th Annual Meeting, Roney Plaza Hotel, Miami, Fla., November 30-December 3.

Electrical & Gas Association of New York, Inc. — Luncheon meeting, Grand Ballroom, Hotel Astor, New York, N. Y., December 22.

Independent Electrical Contractors Association, Inc. — 43rd Annual dinner, Hotel Astor, New York, N. Y., January 15, 1949.

American Institute of Electrical Engineers — Winter general meeting, Pennsylvania Hotel, New York, N. Y., January 31-February 4, 1949.

National Electrical Manufacturers Association — Winter convention, Edgewater Beach Hotel, Chicago, Ill., March 13-18, 1949.

Third International Lighting Exposition and Conference — Hotel Stevens, Chicago, Ill., Week of March 28, 1949.

National Electrical Wholesalers Association — 41st Annual Convention, Netherland Plaza Hotel, Cincinnati, Ohio, May 1-6.

THE BEST WIRE CONNECTORS YOU CAN BUY ARE IDEAL



Patented, No. 1,933,555

**Leading Electrical Contractors
have used Ideal "Wire-Nuts" for
over 20 Years for Circuit and
Fixture Wiring...Millions in Use!**

Ideal "Wire-Nut" connections are preferred over all other types because they are **FASTER—BETTER**—and cut wiring costs!

FASTER because—you simply screw them on, like a nut on a bolt. No solder, tape or **TOOLS** are needed. With a pocket-full of "Wire-Nuts" you can do any ordinary circuit or fixture wiring job from two No. 18 up to three No. 10 wires (solid and/or stranded). Tiresome climbing up and down ladders is minimized!

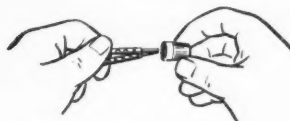
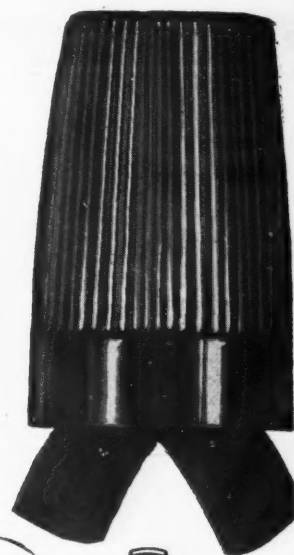
BETTER because—a "Wire-Nut" joint is electrically **SAFE** and mechanically **STRONG**. The Bakelite shell insulates the joint and permanently covers the sharp wire ends, while the spiral spring insert automatically twists the wires and presses in the threads that hold the "Wire-Nut" on with a vise-like grip. Once made, a "Wire-Nut" connection cannot shake loose or pull out. Anyone can make a craftsman-like joint—no experience necessary!

Ideal "Wire-Nuts" are made to highest precision standards. All materials are laboratory tested and every "Wire-Nut" is inspected to rigid specifications. Finished "Wire-Nuts" must pass pull-out (strength) tests, electrical resistance tests, insulation breakdown test (2500 volts) and weather tests to make sure that "Wire-Nuts" are the best connectors that money can buy.

You, too, can enjoy all these advantages when you use **IDEAL "Wire-Nuts"**. Get a box at your electrical wholesaler's **TODAY...** **IDEAL INDUSTRIES, Inc., Sycamore, Illinois.**

*Trade Mark Reg. U. S. Pat. Off.

**Only IDEAL "Wire-Nuts" Give
You All These Advantages**



Easier to use. Just strip the wires and screw the "Wire-Nut" on—that's all! No pre-twisting of wire. Precision-built spring insert twists, threads and grips the wires in a single operation.

Safe. Weather-proof. Non-corrosive. Fully insulated by plastic shell that prevents "grounds" and "shorts". Sharp wire ends are covered.



Resist pull-out. Stronger than other wire connectors because of its "nut-on-a-bolt" gripping action. A "Wire-Nut" joint of two No. 14 wires will stand up to 176 pound pull.



Top Quality. Built to precision standards. Inspected and tested with laboratory care... both for quality of materials and workmanship and for strength of finished product.



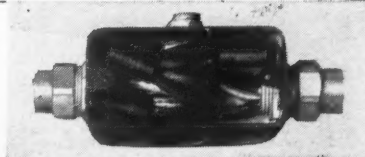
Dependable. Not affected by vibration. In actual service "Wire-Nut" connections have remained secure and perfect under years of heavy vibration.



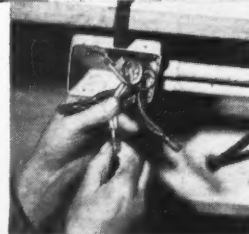
Approved. IDEAL "Wire-Nuts" are listed by Underwriter's Laboratories, Inc. and approved by other leading electrical authorities.

Thousands of Contractors say "Wire-Nuts" are Easier and Faster

MILLIONS OF "WIRE-NUTS" are in use in circuit and fixture wiring in homes, industrial plants and commercial buildings.



"Wire-Nuts" fit compactly into conduit fittings—like peas in a pod.



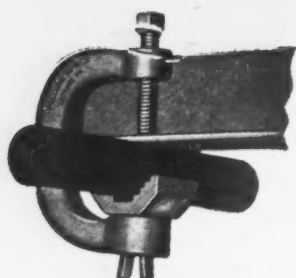
Circuit wiring with "Wire-Nuts" is simple because there are no tools to handle.



Distributed Through
AMERICA'S LEADING WHOLESALERS

FULLMAN *Latrobe* PRODUCTS

★ FLOOR BOXES ★ WIRING SPECIALTIES



**No. 470 "Latrobe"
Pipe or Conduit Hanger**

Made of highest grade malleable iron and cadmium plated, the No. 470 is unexcelled for hanging 1/2", 3/4" and 1" pipe or conduit to steel beams up to 3/8" thick. No. 471 for larger pipe.



**"Bull Dog"
Insulator Support**

"Bull Dog" Supports are safe and efficient for fastening porcelain or glass insulators to exposed steel framework. Four sizes, from 1" to 2 1/2".



**No. 280 Nozzle with
No. 200 Cover Plate**

10 Amp. 250 Volt Receptacle in Brass Housing, mounted on 1/2" brass pipe extension 3" long—longer extension if desired.

ECONOMICAL AND EFFICIENT

"Latrobe" Floor Boxes and Wiring Specialties are swiftly and economically installed. Being soundly designed of finest materials, "Latrobe" Products give a lifetime of dependable service.



**No. 150 Box —
No. 207 Nozzle**

Adjustable and watertight for installation in concrete or wood-finished concrete floors. Furnished with 4 1/4" Cover Plate No. 242 and large Adjusting Ring No. 215.



**"Bull Dog"
BX Cable Staples**

Millions of these high quality, dependable staples are now in use in every section of the United States. Packed in cartons, kegs or barrels.



**No. 110 "Latrobe"
Watertight Box**

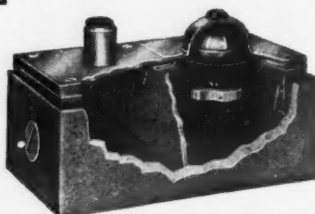
This non-adjustable, watertight Floor Box is extremely simple and compact in design, making for speedy installation and trouble-free service. 208 Receptacle. Cover Plate 3 1/2" diam.

**Sold Only Through
Wholesalers**



**No. 284 Nozzle with
No. 200 Cover Plate**

Neat, compact-fitting and extremely durable, this Duplex Receptacle Nozzle comes with either 1/2" or 3/4" brass pipe extension.



No. 252-R Two Gang Box

This Two Gang Adjustable Box has our No. 208 Receptacle in one section. One Cover Plate has 1/2" Flush Brass Plug; other has 2" Flush Brass Plug.

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

Manufacturers News

G. E. APPOINTMENTS

Appointments of the men responsible for the marketing, manufacturing and engineering of General Electric construction materials have been announced by C. D. Hepler, general manager of the Company's recently formed Construction Materials Department.

A. W. Gilmore, formerly manager of the wire and cable division, becomes manager of marketing; James H. Crawford, manager of sales, becomes sales consultant; Edmund J. Harrington, manufacturing manager of the General Electric Affiliated Manufacturing Companies Department, New York City, becomes manager of manufacturing of the new department; and C. Howard Black, works engineer for the company's Philadelphia plant, becomes manager of engineering.

Named manager of the new divisions are Theodore D. Foster, formerly manager of sales of the accessory equipment and wiring device divisions, who is given responsibility for the accessory equipment division, and Joseph J. Lengyel, formerly manager of sales of the tungar and metallic rectifier division, who heads the wiring device division.

Leland W. Mosher of Schenectady has been elected an assistant secretary of the General Electric Company by the G-E Board of Directors.

John E. N. Hume, commercial vice president, has retired from the company after 41 years' service.

AMERICAN STEEL & WIRE APPOINTMENTS

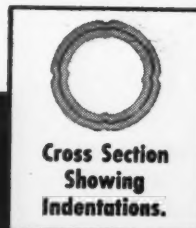
Creation of a new and separate sales division to handle the electrical wire and cable products of American Steel & Wire Co. has been announced. T. F. Peterson, who has headed the section of the general sales staff of the company devoted to electrical products, will serve as manager of sales of the new division.

C. H. Eisenhardt, formerly assistant manager of sales in the section, will serve as assistant manager of sales in the new division.

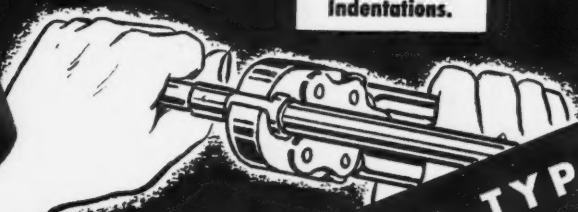
Four new district sales offices under the new organization will be established in Boston to serve the New England district, in Cleveland the Central district, in Chicago, the Western district, and in New York the eastern district.

Appointees to the positions of managers of these various offices are as follows: C. H. Currier, manager, New England district, electrical products sales; V. W. Heimberger, central district; R. A. Coates, western district; C. M. Vaill, eastern district.

Walter E. Mackley has been appointed manager of the New York district sales office of American Steel and Wire Company. F. L. Nonnenmacher has been named manager of manufacturers' products sales to suc-



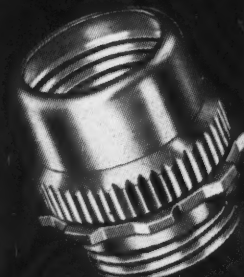
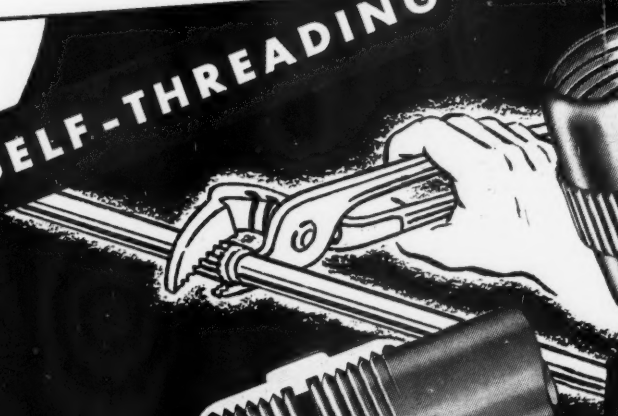
Cross Section
Showing
Indentations.



INDENTER-TYPE

Install E. M. T. Faster and Neater
with BRIEGEL Thin-Wall Fittings

SELF-THREADING



All B-M Fittings Carry the
Underwriters' Seal of Approval



FOR faster, neater and stronger thin wall conduit connections insist on either Briegel Indenter or Briegel Self-threading type all steel, one piece connectors and couplings.

B-M Indenter fittings, the only approved couplings and connectors of this type, have long enjoyed wider use and application than any other method of installing E. M. T.

The new B-M Self-threading fittings now make it possible to have threaded, raintight E. M. T. connections without the use of dies. Two complete turns with a pair of pliers threads the tubing and screws the fittings into a locked position, which results in the strongest connection possible and one that will withstand severe vibration.

Whatever the thin wall job might be, you will find that you can do it neater, faster and better with Briegel UL Approved E.M.T. fittings.

DISTRIBUTED BY

The M. B. Austin Co., Northbrook, Ill. Clifton Conduit Co., Jersey City, N.J. The Steelduct Co., Youngstown, Ohio Nat. Enameling & Mfg. Co., Pittsburgh
Clayton Mark & Co., Evanston, Ill. Gen. Electric Co., Bridgeport, Conn. Enamelled Metals, Pittsburgh, Penn. Kondu Mfg. Co., Ltd., Preston, Ontario

NEATER • FASTER • STRONGER • APPROVED

BRIEGEL METHOD
TOOL
CO.

GALVA, ILLINOIS



Smooth, accurate
conduit offsets
made quickly

WITH A GREENLEE HYDRAULIC BENDER

"Big advantage of the GREENLEE Bender is that it will make any kind of offset needed in a conduit installation.

"Also the fact that this Bender is a single unit means that you can transport and set it up *right on the job* for handling various sizes of pipe."

Thus reports Koeneman Electric Co., St. Louis, Missouri, after completion of one of their recent large installations which called for countless bends in conduit from 1" to 4" sizes.

If you are not now using a GREENLEE Bender, investigate today. See how you,

too, can make *accurate* offsets—all types of conduit bends—quickly, easily. Save greatly on labor and materials.

The GREENLEE Hydraulic Bender is one-man-operated. Makes smooth, precise bends in just a few minutes—in pipe up to 4½", rigid and *thin-wall* conduit, tubing, bus-bars. Compact, portable, easy to set up and operate. Write for free bulletin today.

Greenlee Tool Co., Division of Greenlee Bros. & Co., 1749 Columbia Ave., Rockford, Illinois.



OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK
Hand Benders • Joist Borers • Cable Pullers • Radio Chassis Punches • Pipe Pushers

ceed Mr. Mackley, while Harold Christopher has been promoted to the position of assistant manager of that department.

Mr. Mackley succeeds B. W. Bennett, who has been named assistant to the vice president. In his new capacity, Mr. Bennett will continue to maintain his office in New York, and will handle special assignments.

WESTINGHOUSE CHANGES

A. C. Monteith has been elected vice president in charge of engineering and research of the Westinghouse Electric Corporation, Pittsburgh. He succeeds Marvin W. Smith whose election as executive vice president of Baldwin Locomotive Works, has been announced.

Hobart C. McDaniel has been appointed manager, Technical Press Service in the Public Relations Department. He will succeed Carl E. Nagel, who has resigned to join McGraw-Hill Book Company in New York as editor of mail sales books for the engineering and industrial fields.

GRAYBAR APPOINTMENTS

J. P. McCarthy has been appointed Newark branch manager of Graybar Electric Co.

Harry Cobaugh takes over the job of sales promotion manager for the Eastern district including warehouses and offices in Newark, New Haven, Hartford, Albany, Syracuse, Rochester, Buffalo and sales offices only in Utica and Binghamton.

ROBBINS & MYERS CHANGES

Charles A. Slack, former manager of New York office, Robbins & Myers, Inc., Springfield, Ohio, has been named sales manager of the motor division. John Logan, formerly assistant manager becomes manager New York office.

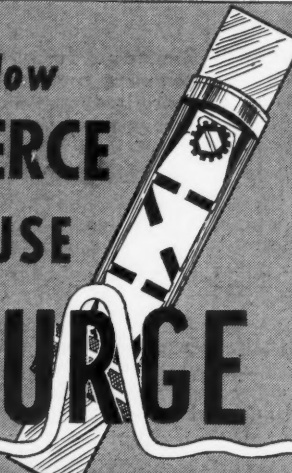
Robert Freundt has been appointed manager of the Philadelphia office, succeeding Donald Ridgway who has taken over as manager of the Chicago office.

Hertner Electric Company, Cleveland Ohio has named Wm. G. Hathaway and Stephen Thurlow, 1550 First Avenue South, Seattle, Wash. as district representatives in the Pacific Northwest.

F. N. Cowperthwait and W. M. Brodhead, 126 Newbury Street, Boston, Mass. have been appointed district representatives in New England.

Pennsylvania Transformer Company, Pittsburgh, Pa. has named Douglas J. Munhall as sales representative in upper New York State. This includes Buffalo, Syracuse, Rochester, Albany, Binghamton, and surrounding territory. His office is at 130 West Chippewa Street, Buffalo.

**How
PIERCE
FUSE
SURGE
CONTROL
SAVES TIME... CUTS
PRODUCTION LOSS!**



Through a close control of the current surge which results from low or momentary high overload, PIERCE Fuses keep your production line humming. No unnecessary shutdowns . . . no lost labor time . . . no production \$ag, when PIERCE Fuses are in your plant! Here's how PIERCE Fuses produce cost-saving Surge Control:



BALANCED LAG LINK — creates more lag at low overloads — where it is necessary and harmless; gives **Safe** lag at high overloads.



SCREEN VENTILATION — takes in cool air and allows escape of heat and gases, reducing unnecessary fuse blowing and banishing dangerous "afterblow".

GET THE FULL STORY of the cost-saving Surge Control features of Pierce Renewable Fuses. Write for descriptive folder--today!

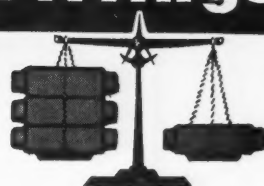
**PIERCE
RENEWABLE
FUSES,
INC.**



177 PACIFIC
AVE.
BUFFALO 7
N. Y.

**DID YOU KNOW
that you can get
Conduit Fittings**

**like
this?**



ALUMINUM ALLOY—2/3 less weight

With no sacrifice of strength, Kondu fittings make a big cut in the weight of conduit lines or portable equipment.

Practically CORROSION PROOF


Many times more resistant to corrosion than other materials previously used for conduit fittings.

Your choice of THREADED or THREADLESS

Threaded Kondu fittings have covers and other accessories interchangeable with the Threadless line. **USE THE RIGHT FITTING** every time—there's a Kondu that's exactly suited.

KONDU CORPORATION, Erie, Penna.

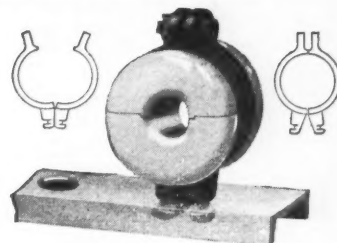
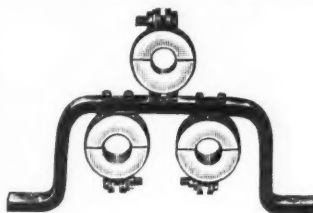
KONDU
The Threadless Fitting Line of Unequalled Variety



**KONDU
MFG. CO. LTD.,
Preston,
Ontario**

"EFFICIENCY" DEVICES FOR CONDUIT and CABLE SUSPENSION

**"For Quick, Safe Cable Installation—Use
EFFICIENCY NESTED CONDUCTOR RACKS**



Efficiency conductor racks feature dependable glazed porcelain bushings, supported and clamped to the rack with a single bolt. Each fitting is a separate unit, permitting simple installation of each cable. Racks are of standard rolled steel channel, made in accordance with the size and number of bushings desired. Bushing supports are malleable iron, but a brass half is furnished for A.C. service. Racks are available for cable diameters from 5/16" to 2 3/8".

Write today for your copy of Catalog 38-A

Efficiency



ELECTRIC AND MANUFACTURING CO.
EAST PALESTINE, OHIO

MANUFACTURERS OF EFFICIENCY
ELECTRICAL DEVICES FOR CONDUIT,
WIRE AND CABLE SUSPENSION

KLEINS

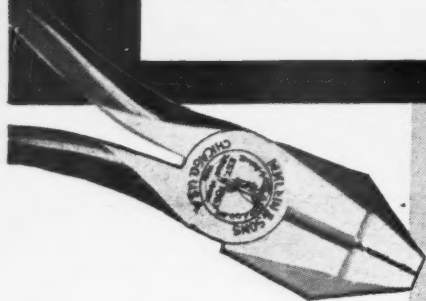
FOR MEN WHO WANT

the Best

• Ever since the first communication and power lines were strung, Klein Pliers have been the favorite tools of electrical workers.

Today, Klein Pliers are made with the same exacting care that has won these tools their reputation for high quality.

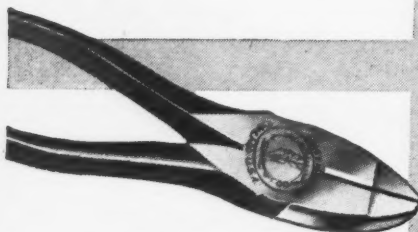
Klein Pliers are still preferred by skilled workers in every field as they have been "since 1857."



No. 201. Original pattern husky Klein Side Cutting Plier. Square nose. Made in five sizes—5, 6, 7, 8, and 9 inches.



No. 242. Klein Oblique Cutting Plier (heavy-duty pattern). A very useful tool that cuts close. Length, 6 inches.



No. 201 NE. The famous "streamlined" Klein Side Cutting Plier. Made in five sizes—5, 6, 7, 8, and 9 inches.



No. 203. Klein Long Nose Plier. Long reach of jaws permits getting into difficult places. Made in 6 and 7-inch sizes.



The Klein Pocket Tool Guide, showing the Klein line and containing useful tool information, will be mailed on request.



Established 1857

Mathias
Established 1857

KLEIN & Sons
Chicago, Ill., U.S.A.

3200 BELMONT AVE

CHICAGO 18, ILL.

Cut'er-Hammer, Inc., Milwaukee, Wis. has acquired the business of the West Electric Products Co., 1795 Pasadena Avenue, Los Angeles, Calif. W. G. Tapping, district sales manager, will be in charge of the new plant.

Standard Switchboard Company of Brooklyn, N. Y. has announced the appointment of the Electrical Distributors Co. as its representative in Eastern Pennsylvania, New Jersey, Delaware, Maryland, Washington, D. C., and Virginia.

Fractional Motors, Inc. has been incorporated to make and distribute fractional motors up to one horsepower. The plant will be in Beloit, Ohio, while sales and distribution offices will be in Cleveland. Charles Brown is president.

A new customer engineering service department, under the direction of Robert C. Singleton, has been established by the Nelson Stud Welding Division of Morton Gregory Corporation at its Lorain, Ohio, headquarters.

Electro Manufacturing Corporation has appointed John L. Dartt as district manager in all of Wisconsin, except the western fringe, and the upper peninsula of Michigan.

The Herman Nelson Corporation, Moline, Ill. has announced the appointment of James D. Hodges as eastern divisional manager of the company's line of portable heaters and portable ventilators.

The C. J. Tagliabue Corporation, has announced the opening of a new sales office at 150 Broadway, New York, N. Y.

Rockbestos Products Corporation, New Haven, Conn. has announced the appointment of Fred S. Bacon, Jr. as assistant general sales manager.

George J. Hepp has been appointed varnish sales manager of the Irvington Varnish and Insulator Company, Irvington, N. J.

Harold L. Pomerantz has been named general sales manager of the Lightcraft Corporation, Jeanette, Pa.

LEW ELECTRIC FITTINGS CO.



Pat. No. 1,858,997

360°
Rigidity
Control
SPIRAL
FISH
CABLE

Manufactured and patented by
Lew Electric Fittings Co. 25 ft—
50 ft.—100 ft. lengths for use in
ovalcondu, Greenfield, or any
metallic tubing.

RIGID CONDUIT BENDER



No. 2100 will form 1/2" to 3/4"
No. 2101 will form 3/4" to 1 1/4"



E. M. T. FORMING TOOLS

Pat. No. 2,233,292
Pat. No. 2,381,064

made to form conduit up to 1 1/4"

No. 221.....1/2" single duty only
No. 224.....3/4" single duty only
No. 1223.....1" single duty only
No. 225.....1 1/4" single duty only
No. 222.....1/2" or 3/4" double duty
No. 223.....3/4" or 1" double duty

The only forming tool with toe release on
hook

Adjustable deep and shallow body FLOOR OUTLET BOXES



Non-Adjustable FLOOR OUTLET BOXES

three 1/2" drilled and
tapped holes in side
and two 1/4" drilled and tapped holes in
bottom.

627 W. LAKE ST.
Chicago 6, Ill.



*Reflects the
Craftsman's Skill*



MANUFACTURED UNDER U. S. PATENTS
2298236 2159837 2334935 2239244
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OTHER PATENTS PENDING

THE MAGNO-TRONIC FLUORESCENT STARTER

PROTECTS
SIMPLIFIES
REDUCES COSTS

VERSATILE

Fully, automatic thermal relay with unusually long life that
eliminates blinking lights and protects all auxiliary equipment.
Replacement of worn-out lamp automatically restores closed
circuit—replacement of starter unnecessary. No button to push.
Magno-Tronic starters provide exact timing in the lamp electrode—preheating process preventing excessive loss of emission
material, thereby assuring the maximum in the useful life of a
lamp. The established quality of this starter saves considerable
time in maintenance and man hours required to repair and/or
replace an inoperative lighting unit.

Will operate efficiently over an extended voltage range under
widely varying temperatures.

GUARANTEED FOR ONE YEAR.

The (SP-15-20) for use with either 15 or 20 watt lamps

The (SP-30-40) for use with either 30 or 40 watt lamps

The (SP-100) for use with 100 watt lamps

Ask for descriptive literature

INDUSTRIAL ELECTRONICS CORP.

MAIN PLANT



Newark 2, N. J.

FOR EVERY

Fitting Job

SPECIFY
AND USE

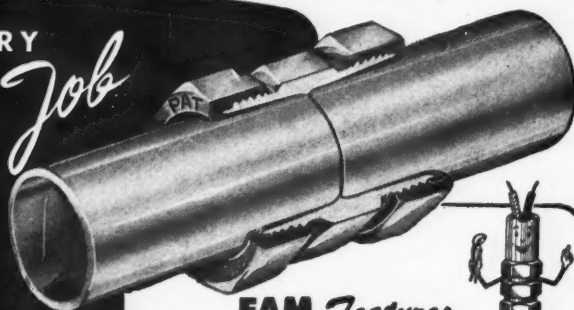
FAM

STEEL
EMT
THIN WALL

COUPLINGS AND CONNECTORS



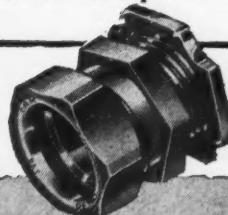
FAM Coupling
(Cutaway View)



FAM Features

1. Simple, fast installation
2. No rings to cock or lose
3. Precision machined taper fit
4. Cuts surface for positive ground
5. Raintight—UL Approved

Write for Descriptive Literature



FAM
Connector

FISHER-ARMOUR MFG. Co.

757 Waveland Avenue
Chicago 13, Illinois

GENERATE YOUR OWN

ELECTRICITY

FOR ANY PURPOSE—AT LOW COST

with a

Universal ELECTRIC PLANT

ECONOMICAL electric power is yours with a Universal. In initial cost, operation and maintenance—these properly engineered electric plants are lowest in cost.

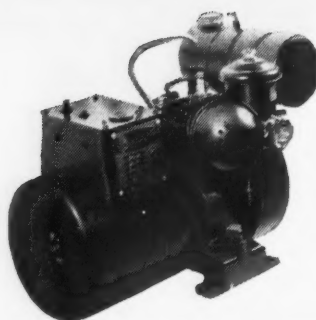
Universal offers a broad range of sizes and types—assuring a model suited exactly to your needs. There are portable, stand-by and stationary models AC or DC, from 250 to 25,000 watts—1 to 6 cylinders. There is every type of control—manual to fully automatic.

All Universals are of matched unit construction—with engine and generator exactly suited to each other... your assurance of long, reliable service.

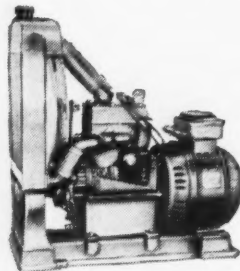


Send for Booklet, "Electricity at Low Cost" for facts and photos of Universal Electric Plants.

Contractors and Representatives! Write for full details on the profitable Universal franchise.



Lightweight, easily carried—this Universal model provides 550 watts. Electric starting. Many other portable plants, all sizes, hand-carried, dolly, trailer, etc.

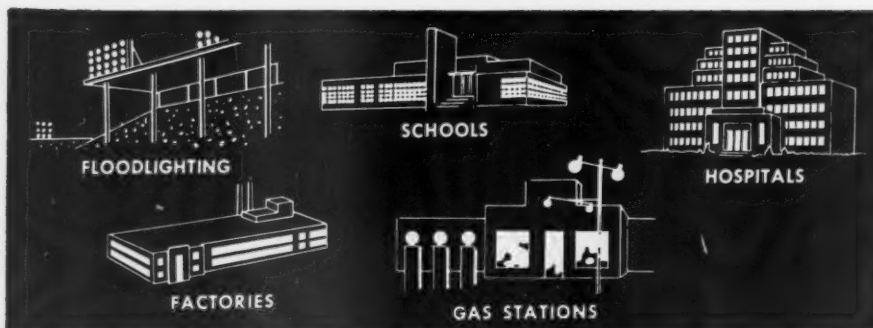


Universal 2500-3000 watt plant provides reliable, low-cost service. Powered by Universal 2-cylinder water-cooled engine. Other models to 25,000 watts.

UNIVERSAL MOTOR COMPANY

FOUNDED 1898

438 UNIVERSAL DRIVE • OSHKOSH, WISCONSIN



COST FACTORS FOR CABLES

[FROM PAGE 51]

which gives an installed cost of \$2.00 per ampere per 100 ft. for a total cost for the 200 ft. run of about \$800. Of course, for this example the result could have been obtained directly from the estimating data given in Table 5. The chief virtue of the chart is that it gives a picture of how one cable compares with the next size and aids in doing a better job of selecting cable.

Scales are also included on the charts for kva. and dollars per kva. at 460 volts since this voltage is widely used in industrial plants.

Capitalized Losses

The data on installed cost of cable will be useful for making comparisons between systems where the electrical losses in the systems are not greatly different, or where the cost of the losses is small in relation to the installed cost. For comparisons where the influence of different losses is important, comparisons including the effect of losses may be made using the method of present worth.

In this method, the annual cost of the losses is capitalized at a suitable rate. The resulting present worth value is equivalent to the amount of investment that would be justified to reduce the losses to zero. By using the sum of the capitalized value of the losses and the installed cost of the cable, direct comparisons may be made.

The rate of return or rate of capitalization varies among the different industries. For many it will be between 20 and 35 percent. A typical rate is summarized below:

Depreciation (straight line based on 8 years life)	12.5 percent
Interest on investment and return	10.0 percent
Taxes, insurance and misc.	2.5 percent

Total rate 25. percent

For a typical industry operating eight hours per day, five days per week, and 52 weeks per year with electric energy costs of 1 cent per kw. hr. (including both demand and energy charges), and a capitalization rate of 25 percent, the capitalized value of electric losses is \$80 per kw. of loss. This value has been used to compute the capitalized value of the losses for adding to the installed costs to obtain Fig. 5b for Type R cable. Similar charts with capitalized losses will also be included in Part II for the other cable types.



Better get the **KNOPP** Voltage Tester with the **PROD-MOUNT**

For Safety and
Ease of Use, One of
the Prods Mounts
in the Housing!



It has 5 Safety Features

Say "Goodbye to risky, time-wasting fuss in testing" with the 5 main safety features in the Knopp Voltage Tester: (1) exclusive Prod-Mounting Socket in housing making this tester easier, faster, and safer to use and ending time-wasting "three-handed" testing; (2) protection through DUAL indication of voltage by solenoid and neon lamp working independently; (3) positive scale reading; (4) signal by hum and vibration; and (5) thorough insulation throughout, even to the sharp point of each prod.

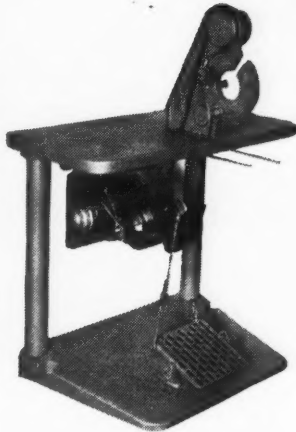
Well built and shock-proof in a LAMINATED bakelite housing, the Knopp Voltage Tester tells immediately and simply if circuit is open or closed; magnitude of voltage between 110 and 600; a-c or d-c, pure or rectified; 25 or 60 cycles—for testing old and new circuits, fuses, locating grounds, etc.

Get the widely-used and reliable Knopp Voltage Tester with the Prod-Mount, and other safety features, from your dealer, or write for illustrated, free information sheets.

ELECTRICAL FACILITIES INC.

4232 HOLDEN ST. OAKLAND 8, CALIF.

HIGH SPEED TAPING MACHINE



HIGH SPEED is the answer! Not only is it possible to **tape more coils in far less time**, but the high speed operation is **actually less tiring** on the operator.

Let the Potter and Rayfield High Speed Taping Machine save money for you. The average stator coil can be taped in **less than 30 seconds**.

Do away with time consuming hand taping operations and antiquated slow speed equipment. Increase the efficiency of your taping operation with this time-saving machine. Give better service for your customers and at the same time, greatly reduce labor costs.

Available for floor mounting as illustrated, or for bench mounting. Write for descriptive bulletin or contact your local representative.

This is another of the many time-saving machines we produce for the electrical manufacturing and repair industries. If you do not have a copy of our complete catalogue, we will be pleased to forward one at your request.



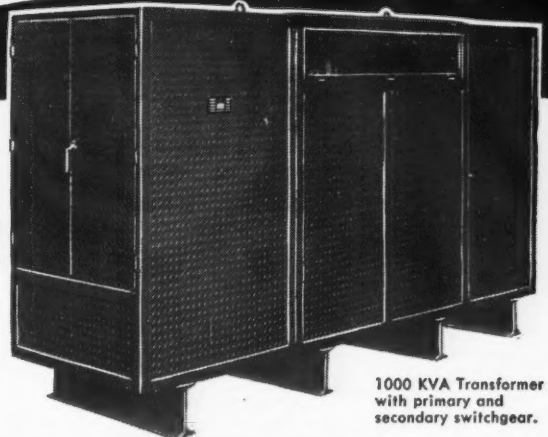
P. O. BOX 1042C

ENGINEERING
CRAFTSMANSHIP

ATLANTA, GA.

PACKAGED POWER!

SAFE!
COMPACT!
ECONOMICAL!



1000 KVA Transformer
with primary and
secondary switchgear.

Marcus Unit Substations are available in sizes from 100 to 1000 KVA in primary voltages up to 15000 V.

They are made with various types of entrances and controls for primary, high voltage circuit. The low voltage side can be designed for any type and number of breakers according to customer requirements. Class B and C, heatproof insulation featured throughout.

- SPECIAL TRANSFORMERS, 1 to 1000 KVA To Meet Individual Requirements
- ELECTRIC FURNACE TRANSFORMERS
- RECTIFIER TRANSFORMERS
- WELDING TRANSFORMERS
- PHASE CHANGING TRANSFORMERS
- TAPPED AUTO TRANSFORMERS
- MOTOR STARTING TRANSFORMERS
- GENERAL PURPOSE TRANSFORMERS

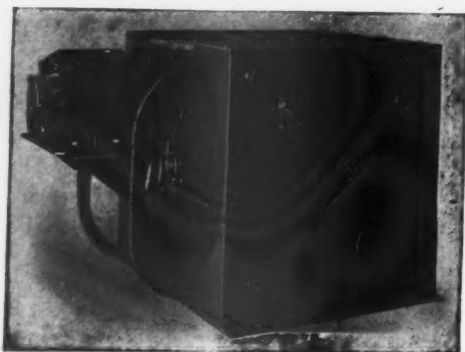
PIONEERS IN THE FIELD OF AIR-COOLED TRANSFORMERS

MARCUS TRANSFORMER CO., INC.

32-34 MONTGOMERY STREET • HILLSIDE 5, NEW JERSEY

AIR EQUIPMENT TO HELP YOUR BUSINESS

Cash in on this BETTER AIR SERVICE —easily installed



Buffalo
fans!

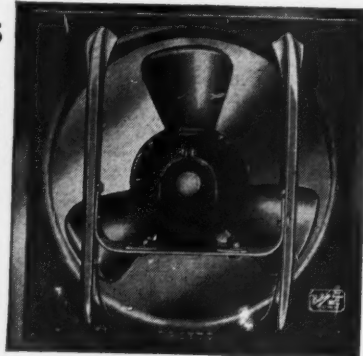
"L" BREEZO FANS

Shops need these rugged, enclosed fans for exhausting gases, vapors, fumes from hoods and vats! Motor is PROTECTED — separated from air

stream. Sizes to handle your requirements—12" to 36"—capacities up to 7300 cfm at $\frac{1}{4}$ " static pressure. Let us mail you Bulletin 3222-F for your next exhausting job. Write now for your copy.

"BUFFALO" BREEZO FANS

One of our most popular fans, because it is so easily installed and so attention-free on the job. Die-stamped blades and square panel—welded-on arms—first quality motors—blades shaped to move a lot of air on a little power—an ideal fan for small-area ventilation. Six sizes, 8" to 24". Write for Bulletin 3222-F.



BUFFALO FORGE COMPANY

520 Broadway Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Branch Offices in all Principal Cities



EQUIPMENT

- ★ VENTILATING
- ★ HEATING
- ★ COMFORT COOLING
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SIGNAL SYSTEMS FOR PUBLIC BUILDINGS

[FORM PAGE 53]

from one point to another. An illustration of a typical smoke detection unit is shown in Figure 3.

Sprinkler alarm systems are composed of a number of waterflow valves, shut-off valves and post indicator valves provided with contacts so that an alarm will be transmitted to either audible signals, indicating relays, annunciators or a combination of same. The release of a water sprinkler head or a noticeable leak causes the vane in the waterflow valve to operate, which in turn actuates the electrical spring contacts. The shut-off and the post indicator valves also have contacts and operate a signal when they are placed in a sub-normal position. That is, normally the valves would be open to permit the flow of water through them, however, if these valves were closed either by accident or design, a signal would be given to show that the flow of water had been stopped. These systems are usually installed in storage spaces and other hazardous locations where a deluge is found necessary to prevent the spread of a possible fire. It is not usually considered where water might completely damage the contents in a given location.

Watchman's tour systems are considered very necessary in all public buildings. In very large buildings it is advisable to use a system which will enable the watchmen on their tours to signal and record their calls and also be in a position to converse with the chief guard if found to be necessary. It should also be possible for the chief guard to call any watchman at any station on any tour. A system of this type is comprised of watchman's stations distributed in such a manner that all areas are covered even to the remotest point. Each station is equipped with a jack and a bullseye. The jack is used for signaling to the central desk in the guard room. When a dummy plug is inserted a record is made on a paper chart in the desk indicating the station number and the time of the call. The bullseye is used for signaling the watchman on tour from the desk. When the plug of a portable handset is inserted in the station jack, a conversation can take place between the guard on tour and the chief guard at the desk. A combination fire alarm and watchman's station with the bullseye at the top and the jack at the bottom is shown in Figure 4.

Call systems of many types may be

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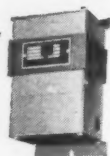
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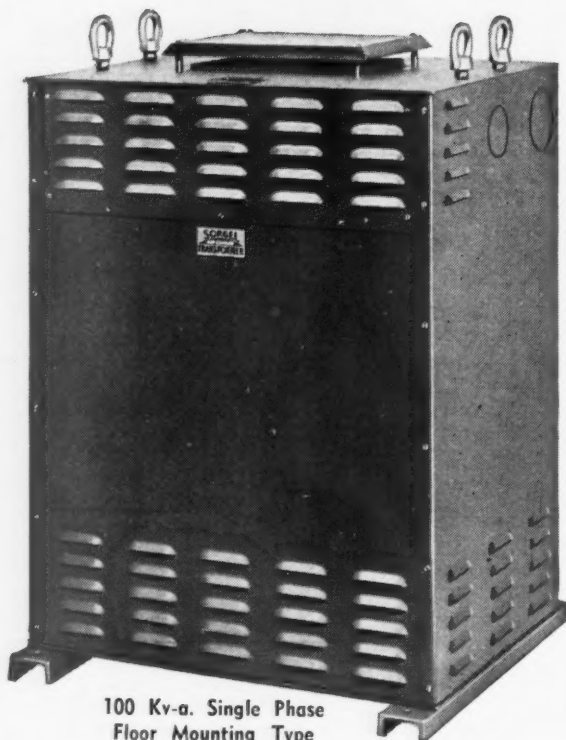
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used in the various buildings. Individual return call systems in which the pushbuttons and a buzzer may be combined in one block for calling back and forth between two points. Other systems may be composed of pushbutton blocks on desks, counters etc. which will operate lamps or drops in annunciators and pilot or return signals such as lamps on the originating calling station. In certain types of buildings where doors are to be supervised it is necessary to install electric door locks on doors and release them from pushbuttons at specified locations. In public buildings these component parts are usually required in special finishes to match the surroundings, such as the woodwork or metal trims. Exterior pushbuttons for door bell systems should be watertight. They are usually located at the front, rear and boiler room entrances. The audible signals such as bells should be of the heavy duty type.

Clock Systems

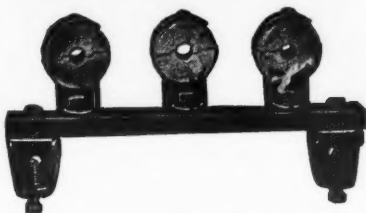
Clock systems may be composed of various types of units as described in previous articles. However, certain buildings such as museums should be provided with program devices to transmit dismissal signals indicating the closing hours to the public. They may also be set to advise the guards as to the opening hours. Many of the clocks particularly those located on marble walls in lobbies, reading rooms in libraries and large court rooms are usually of a special nature to correspond with the design and decorations of such a location.

Garage ramps are often equipped with photo-electric equipment and arranged so that the doors will automatically open to permit an automobile or other vehicle to enter. A double ray is used so that they will not be affected or interrupted by a person who may be passing. A diagonal ray may also be used to prevent the door from lowering while the vehicle is still in the ramp. A bell signal may be located in the garage to advise attendants that a vehicle is to enter.

Signals are most important for passenger and freight elevators. These consist chiefly of up and down pushbuttons on every floor except on the extreme lower and upper floors, with the associated annunciators in the elevator cabs. These are usually supplied by the elevator manufacturers. All passenger elevators should be equipped with telephones for emergency purposes. For dumbwaiters two types of signals are generally used. The simplest consists

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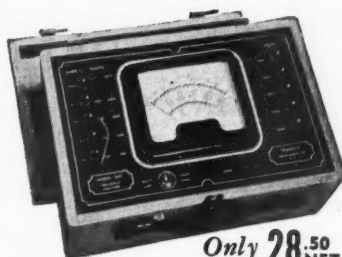
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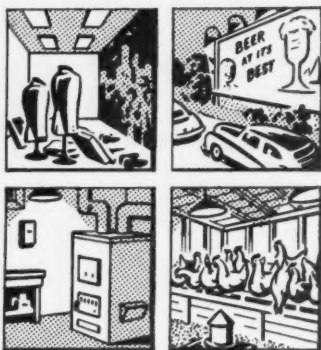
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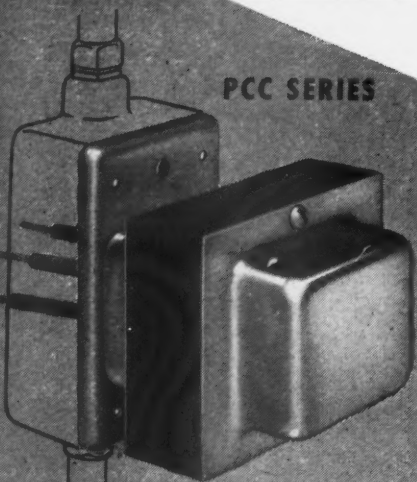


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of a pushbutton plate adjacent to each dumbwaiter opening having a number of pushbuttons equivalent to other stations to be called, that is, if there are four floors, the plates would require three pushbuttons, for three floors two buttons etc. A buzzer is included with each plate as a calling signal for each respective station. Where one point of distribution is to be maintained a master plate having a pushbutton for each outlying station and a buzzer is used. All outlying stations have a plate with one pushbutton and a buzzer. This will permit the master pushbutton station to call the outlying stations, while the outlying stations may call the master station. Telephones may also be used in dumbwaiter systems for calling in the same manner as described for the pushbutton system with the advantage of being able to converse between the points involved.

Intercom Systems

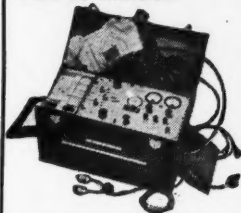
All public buildings should be equipped with auxiliary intercommunicating telephone systems which will permit contact with various departments without causing confusion, interruptions or tying up the regular public telephones. These may be secured in different types, such as master selective ringing-common talking, selective-ringing-selective talking, manual switchboard and automatic dial. Lamp signals may also be combined with many of these systems for special purposes. The selection of the system depends upon the number of stations to be used, whether or not more than one conversation will be held at one time, whether the system is to be under the control and supervision of an individual or whether selectivity is to be obtained without the supervision of an attendant.



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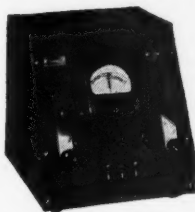
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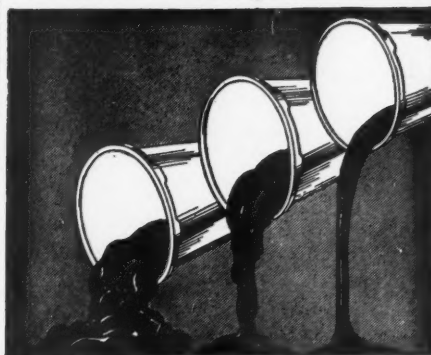
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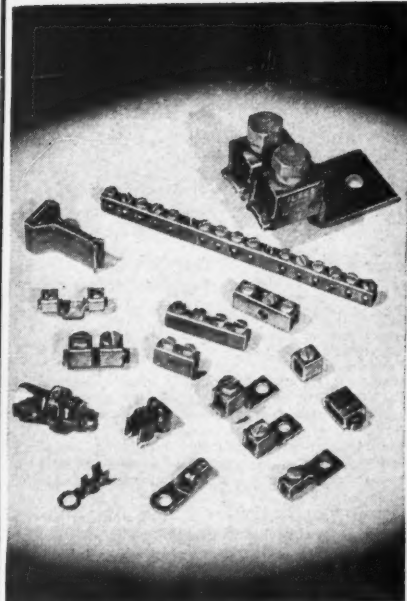
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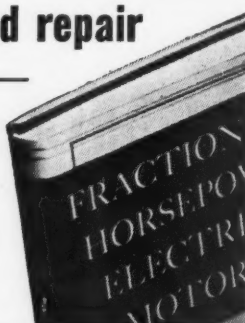
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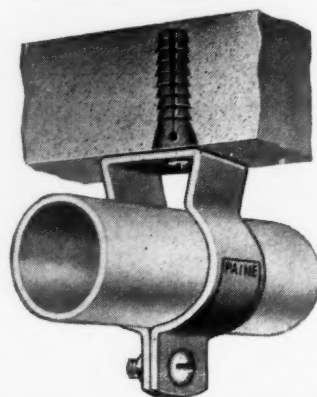


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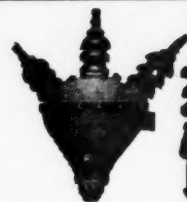


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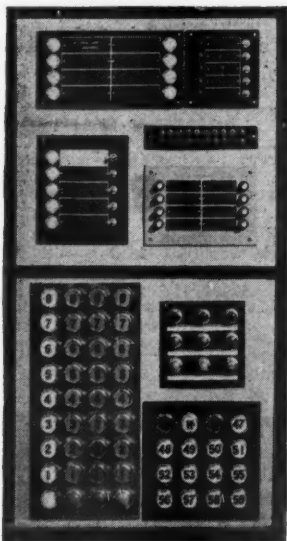
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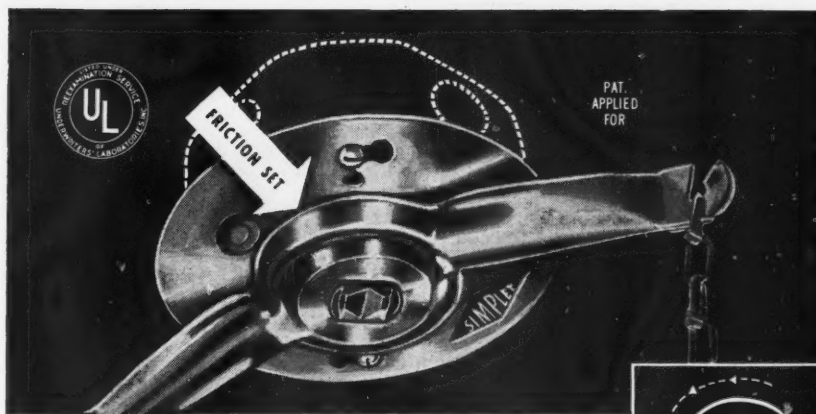


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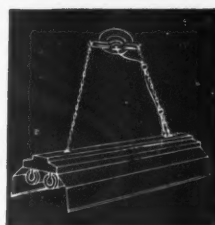
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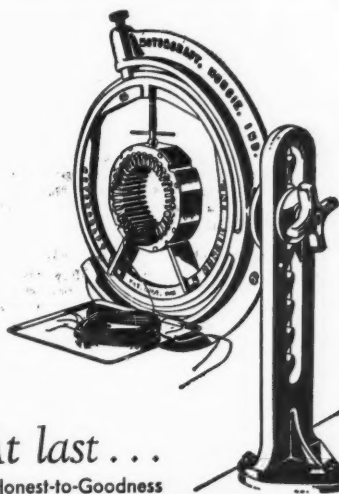
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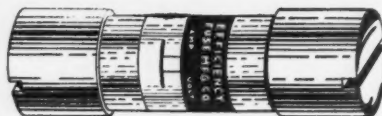
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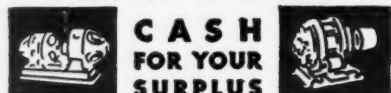


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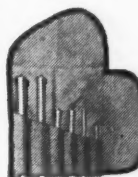
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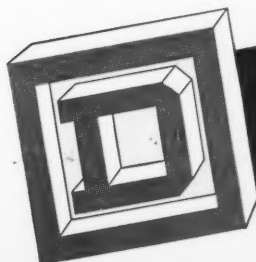
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